Operation and Maintenance Report

January 2016 to December 2016

McCormick and Baxter Superfund Site

Portland, Oregon

ECSI Site No. 74

Prepared for

Oregon Department of Environmental Quality

March 23, 2017

15670-10/Task 4

GSI Water Solutions, Inc.

HARTCROWSER

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Prepared by

GSI Water Solutions, Inc.

Erin Carroll Hughes, LHG
Hydrogeologist

Hart Crowser, Inc.

Richard D. Ernst, RG
Program Manager

Hart Crowser, Inc.

Philip R. Cordell, R.G.
Site Manager

6420 SW Macadam Ave., Suite 100
Portland, Oregon 97239
Fax 503.620.6918
Tel 503.620.7284

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Acronyms and Abbreviations

ACB	articulated concrete block
ACLs	alternate concentration limits
AWQC	ambient water quality criteria
bgs	below ground surface
BES	City of Portland, Bureau of Environmental Services
°C	degrees Celsius
DEA	David Evans and Associates
DEQ	Oregon Department of Environmental Quality
DNAPL	dense non-aqueous phase liquid
DVD	digital video disc
EPA	U.S. Environmental Protection Agency
ft/ft	foot per foot
FWDA	Former Waste Disposal Area
GSI	GSI Water Solutions, Inc.
Hart Crowser	Hart Crowser, Inc.
HC/GSI	Hart Crowser/GSI Water Solutions, Inc.
ICs	institutional controls
IDW	investigation-derived waste
IGA	Intergovernmental Agreement
LNAPL	light non-aqueous phase liquid
MCLs	maximum contaminant levels
mg/kg	milligrams per kilogram
NAPL	non-aqueous phase liquid
NAVD88	North American Vertical Datum of 1988
NOAA	National Oceanic and Atmospheric Administration
ng/L	nanograms per liter
NW Natural	Northwest Natural
O&M	Operation and Maintenance
OSU	Oregon State University
PAHs	polycyclic aromatic hydrocarbons
PCP	pentachlorophenol
PPE	personal protective equipment
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act

ACRONYMS AND ABBREVIATIONS (CONTINUED)

RM	River Mile
ROD	Record of Decision
site	McCormick and Baxter Superfund site
TFA	Tank Farm Area
TRM	turf-reinforced matting
µg/L	micrograms per liter
USGS	U.S. Geological Survey

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1.0 INTRODUCTION AND PURPOSE

This Operation and Maintenance (O&M) Report has been prepared for the Oregon Department of Environmental Quality (DEQ) to document the O&M activities implemented at the McCormick and Baxter Superfund Site (site) located in Portland, Multnomah County, Oregon, between January 1, 2016, and December 31, 2016.

O&M activities are identified in the Final O&M Plan prepared by the DEQ and the U.S. Environmental Protection Agency (EPA) (DEQ/EPA 2014). The Final O&M Plan defines the administrative, financial, and technical details and requirements for inspecting, operating, and maintaining the remedial actions at the site. The DEQ and EPA reduced the scope and frequency of O&M activities conducted at the site in 2010, from the frequency conducted at the site from 2005 through 2010. The Final O&M Plan reflects that reduction. The O&M Manual specifies the sampling and monitoring procedures, quality assurance and quality control, technical information, and data necessary for implementing O&M activities. The O&M Manual is a living document that is modified periodically to reflect necessary monitoring and maintenance needs at the site. Hart Crowser, Inc., and GSI Water Solutions (HC/GSI) recently updated the O&M Manual this past June (HC/GSI 2016).

The purpose of this O&M Report is to document the operation, monitoring, and maintenance activities that occurred in calendar year 2016. Figure 1-1 shows the location of the site, Figure 1-2 presents the site layout and features, and Figure 1-3 presents the site capping components. Figure 1-4 presents the site layout with surface elevations. Figure 1-5 presents the historical contaminant areas, and Figure 1-6 presents historical non-aqueous phase liquid (NAPL) distribution. This report has been prepared by DEQ's contractor team, Hart Crowser and GSI.

The O&M performance standards and activities for the soil cap and sediment cap are discussed in Section 2 and 3, respectively. The groundwater performance standards and activities are summarized in Section 4. Vegetation management is presented in Section 5. Section 6 discusses the remedy protectiveness, and Section 7 presents recommendations for 2017. Section 8 provides references. Appendix A provides a photographic log of activities or observations associated with O&M activities. Appendix B provides documentation including the field observation forms for the soil and sediment cap, status meeting summaries, and the sign-in log, and Appendix C provides the photographic log for vegetation observations.

Routine operation, monitoring, and maintenance activities in 2016 were implemented primarily by the DEQ's contractor, Hart Crowser, and its teaming partner GSI (under subcontract to Hart Crowser).

O&M activities were also performed by Amaral (weed control) and Waste Management (investigation derived waste [IDW] disposal).

Key personnel for implementation of O&M activities include:

- Sarah Miller: Oregon DEQ Project Officer
- Steve Campbell: Oregon DEQ Contract Officer
- Rick Ernst: Hart Crowser Program Manager
- Heidi Blischke: GSI Technical Manager
- Phil Cordell: Hart Crowser Site Manager
- Erin Carroll Hughes: GSI Hydrogeologist

2.0 SOIL CAP PERFORMANCE STANDARDS AND ACTIVITIES

This section presents a summary of soil cap performance standards, observations, and maintenance activities at the site for the reporting period January 1, 2016, through December 31, 2016, and a summary of remedy performance as related to the performance standards. The Final O&M Plan provides a description of the remedial action objectives and the soil operable unit remedy. Table 2-1 provides the soil cap activities conducted in 2016.

2.1 Soil Cap Performance Standards

Contaminated soil was removed and an upland soil cap was constructed on approximately 41 acres of the site in September 2005. Institutional controls (ICs) have not been completed for this portion of the site. Soil beneath the soil cap remains contaminated with arsenic, pentachlorophenol (PCP), polycyclic aromatic hydrocarbons (PAHs), dioxins, and NAPL and requires long-term monitoring and maintenance. The performance standards for the soil cap are as follows.

- Maintain contaminant concentrations in surface soil below the following risk-based cleanup goals, as specified in the Record of Decision (ROD) (EPA 1996):
  - Arsenic: 8 milligrams per kilogram (mg/kg)
  - PCP: 50 mg/kg
  - Total carcinogenic PAHs: 1 mg/kg
  - Dioxins/furans: 0.00004 mg/kg
- Maintain the topsoil layer to within 50 percent of its design specification as follows:
  - Maintain a topsoil thickness of at least 6 inches for the area over the impermeable/geomembrane cap.

- Maintain a topsoil thickness of at least 12 inches for all areas except over the impermeable geomembrane cap.

- Minimize infiltration of rainwater within the subsurface barrier wall by maintaining the subsurface stormwater conveyance system.

- Minimize stormwater erosion and ponding outside the barrier wall by maintaining site grading, surface stormwater conveyance, and native vegetation.

- Maintain native vegetation within the 6-acre riparian zone for compliance with the National Marine Fisheries Service Biological Opinion (National Oceanic and Atmospheric Administration [NOAA] 2004).

2.2 Soil Cap Observations

Soil cap observations were conducted according to the Final O&M Plan. Routine site inspections were conducted on January 22, April 20, July 21, and November 17, 2016, by the DEQ and Hart Crowser/GSI. These inspections are documented on observation forms developed for the site. Supporting documentation and pertinent details are included in Appendix B. Observations of interest from the routine inspections are summarized on Figure 2-1 and described below. As required for the site administrative record, a log of all site visitors in 2016 was kept and is also included in Appendix B.

2.2.1 Visual Inspection

The upland soil cap provides habitat for rabbits, ground squirrels, Canada geese, several other species of birds, and coyotes. Despite placing gravel to fill gaps under the fence around the upland portion of the site, periodic burrowing continues to be observed under the fence and along the perimeter road. These burrows are filled as necessary and are not of major concern.

Evidence of ground squirrel activity was observed at several locations throughout the upland soil cap. Ground squirrels are common to the area, and their burrows typically extend to approximately 1 foot below ground surface (bgs). The ground squirrels use the surplus articulated concrete block (ACB) stockpiled at the site, paved roadway, and concrete well monuments as habitat. A larger than typical animal burrow was observed on the soil cap, likely from a coyote (Photographs 1 and 2, Appendix A). None of the observed burrows extend more than 1-foot into the 2-foot soil cap and, therefore, the soil cap continues to isolate site contaminants from human and ecological receptors. Continued monitoring of the burrows is recommended; no action to remove burrowing animals or to fill in the burrows is planned or is necessary at this time.

The gate at the top of North Edgewater Road marks the entrance to the site and Willamette Cove property. This gate, which is locked with a series of locks and a chain, provides access for two railroads, Northwest Natural (NW Natural), the DEQ, and other agencies that require access to the area. The Union Pacific Railroad tracks, which run parallel to the site and neighboring properties, are often used by transients and the public to access the area. Access to the area generally does not affect security because of the surrounding fence, lighting, and alarm system at the site. A section of the fence and a

warning sign were found damaged during the January 2016 site visit, and subsequently repaired (Photographs 3 and 4; Appendix A).

2.2.2 Soil Cap Subsidence

In June 2008, subsidence of the soil cap was observed near groundwater monitoring wells EW-1s and MW-23d. An upland site survey confirmed that the ground surface had subsided approximately 1 foot in a limited area around the wells between the time that the soil cap was installed in 2005 and 2008. A Subsidence in Upland Cap Memorandum (HC/GSI 2008) and an Additional Subsidence Monitoring Memorandum (HC/GSI 2009) present the results of the survey and additional investigation to determine the cause of the subsidence.

Based on elevated groundwater temperatures in well EW-1s (40 °C) and the large amount of buried woody debris in the area, it is suspected that aerobic degradation of woody debris was occurring and causing the ground surface subsidence. Decreasing groundwater levels within the barrier wall also may have contributed by opening a larger unsaturated zone that allows compaction. In 2009, the shallow well EW-1s, was sealed to reduce the amount of oxygen reaching the unsaturated zone. Since the well was sealed, the subsidence has slowed and no additional subsidence has been observed the past four years. The groundwater temperature dropped to approximately 21-23°C and has remained stable for the past 6 years. This temperature is still higher than groundwater from surrounding wells (approximately 13°C) indicating that some heat is still being produced in the subsurface near well EW-1s; this may be caused by anaerobic degradation, which generates less heat than aerobic degradation.

Ground surface subsidence is monitored by measuring the inner polyvinyl chloride (PVC) casing at well MW-23d relative to the steel outer casing of the well. The inner casing extends to 182 feet bgs and is considered to be stable. The outer casing is representative of the ground surface and if the casing (or ground surface) subsides, then the distance between the inner and outer casing decreases. There has been essentially no change in distance measured since 2012. Slight differences in the distance measured (within 0.10 inch for all events) is likely due to variability in measuring equipment and operators. The distance has been measured at 2.75 inches since 2012. The total decrease in distance between the inner and outer casing since December 2008 (first periodic measurement conducted) is approximately 1.35 inches. Thus, approximately 1.35 inches of subsidence of the ground surface in this area has occurred since 2008 with most of it occurring in 2009.

While not anticipated, significant additional settling in this area could affect performance of the stormwater conveyance system. The stormwater conveyance system was inspected four times during 2014 and continues to perform as designed with steady flow from the outfall during and immediately after rainfall events. During 2017, Hart Crowser and GSI will continue to monitor the area by measuring the casing difference at MW-23d, continuously measuring the water level and temperature at EW-1s, and monitoring the discharge at the stormwater conveyance system outfall.

2.3 Soil Cap Maintenance Activities

Relatively little soil cap maintenance was required in 2016. Maintenance in 2016 included filling animal burrows along the fence line, replacing gate locks, replacing the sump pump in the drum storage area, patching holes in the job trailer siding, repairing the east fence, and performing backflow testing on the water line. Weed control and was conducted in the spring of 2016 and is discussed in detail in Section 5.4.

On January 20, 2016, burrows were filled around the perimeter fence and locks were replaced on the two gates leading to the trailer area. Nesting birds created holes in the job trailer in 2015 and the trailer was tarped in early February 2016. The tarp later blew off following a winter storm and on February 19, 2016, the holes were filled with foam and covered with plywood (Photographs 5 and 6; Appendix A). The pump that drains the stormwater collection sump in the drum storage area was replaced on March 2, 2016. Repairs to the east fence were made on July 21, 2016. The backflow preventer on the waterline was tested on September 16, 2016.

Investigation-derived waste generated during 2015 compliance sampling was disposed of in June 2016. One drum of purge water generated during MW-59s compliance sampling and one drum of organoclay and sediment from the sediment cap monitoring was removed from the site and disposed of at the Chemical Waste Management Facility in Arlington, Oregon (EPA ID Number ORD089452353). Waste Disposal documentation is included in Appendix B.

2.4 Summary of Soil Cap Remedy Performance

Overall, upland soil cap observations and inspections revealed no significant change in remedy performance or areas of concern. Future O&M activities will primarily consist of quarterly inspections and routine maintenance. Decommissioning of nonessential and obsolete equipment began with removal of the irrigation system in December 2016 and will continue with removal of the job trailers in February 2017.

The degree of upland soil cap subsidence near wells EW-1s and MW-23d is currently stable. This area will continue to be monitored in 2017 by taking inner and outer casing measurements at well MW-23d; by monitoring stormwater flow at the outfall during quarterly inspections; and by collecting and reviewing transducer data from EW-1s that measures groundwater temperature and elevation.

3.0 SEDIMENT CAP PERFORMANCE STANDARDS AND ACTIVITIES

This section summarizes sediment cap observation and maintenance activities for the reporting period January 1, 2016, through December 31, 2016. Site observations and maintenance activities were conducted according to the Final O&M Plan. Sediment cap inspections were conducted in January, April, July, and October 2016 by the DEQ, and Hart Crowser, GSI in conjunction with inspections for the entire site. Observations of interest from the routine inspections and site meetings are presented on Figure 2-1. Routine inspections are documented in observation forms developed and recorded for the site (Appendix B). Table 3-1 provides a summary of sediment cap activities conducted in 2016.

3.1 Sediment Cap Performance Standards

The sediment remedy consists of a 23-acre cap over contaminated sediment within the Willamette River and includes ICs. The sediment cap remedy was completed in September 2005, and an Easement and Equitable Servitude was completed in 2006 to restrict sediment cap use and access. Sediment beneath the sediment cap remains contaminated with arsenic, PCP, PAHs, dioxins, and NAPL. The performance standards for the sediment cap are as follows.

- Maintain contaminant concentrations in surface sediment below the following risk-based cleanup goals, as specified in the ROD (EPA 1996).
  - Arsenic: 12 mg/kg, dry weight
  - PCP: 100 mg/kg, dry weight
  - Total carcinogenic PAHs: 2 mg/kg, dry weight
  - Dioxins/furans: $8x10^{-5}$ mg/kg, dry weight
  - Protection of benthic organisms based on sediment bioassay tests, resulting in impaired survival and growth (i.e., weight)
- Minimize contaminant releases from sediment that might result in contamination of the Willamette River in excess of the following federal and state ambient water quality criteria (AWQC):
  - Arsenic (III): 190 micrograms per liter (µg/L)
  - Chromium (III): 210 µg/L
  - Copper: 12 µg/L
  - Zinc: 110 µg/L
  - PCP: 13 µg/L
  - Acenaphthene: 520 µg/L
  - Fluoranthene: 54 µg/L
  - Naphthalene: 620 µg/L
  - Total carcinogenic PAHs: 0.031 µg/L
  - Dioxins/furans: $1.4x10^{-5}$ nanograms per liter (ng/L)
- Maintain the armoring layer to within 50 percent of the design specification throughout the cap. The design specifications are as follows:
  - 6-inch rock armoring: maintain at least 6 inches thick
  - 12-inch rock armoring: maintain at least 7.5 inches thick
  - 24-inch rock armoring: maintain at least 12 inches thick
- Maintain uniformity and continuity of ACB armoring.

- Assess performance of organophilic clay to ensure it is preventing the release of mobile NAPL to the Willamette River (potential assessment parameters include sorption capacity, measure of NAPL currently sorbed, and permeability).

AWQCs listed above were the surface water criteria in effect at the time of the ROD (EPA 1996); since completion of the ROD, additional recommended EPA water quality criteria were published in 2007, and more stringent AWQCs for human health were adopted by the DEQ and approved by the EPA in 2011. During meetings in August 2007 among stakeholders (DEQ, EPA, National Oceanic and Atmospheric Administration, Confederated Tribes of Warm Springs, and Yakama Nation), it was agreed that for comparison purposes, the following five criteria would be included in analytical results summary tables in the Annual O&M Reports.

- Two AWQCs in effect at the time the ROD was issued:
  - 1996 criteria for chronic effects to aquatic life
  - 1996 criteria for human health based on fish consumption
- Two 2007 National Recommended Water Quality Criteria:
  - 2007 criteria for chronic effects to aquatic life
  - 2007 criteria for human health (consumption of organisms)
- Current EPA maximum contaminant levels (MCLs)

Future comparison criteria will include the EPA-approved 2011 AWQCs updated in 2015 for human health and other applicable AWQCs at the time of sediment cap water sampling. These criteria were used as comparison criteria for the Fall 2015 passive surface water and sediment cap porewater sampling event.

3.2 Sediment Cap Observations

Routine sediment cap inspections were conducted on January 22, April 20, July 21, and November17, 2016 in conjunction with the four quarterly site meetings. Sediment cap inspection documentation is included in Appendix B. Sections 3.2.1 and 3.2.2 describe sediment cap observations regarding habitat enhancement features, wildlife, vandalism, and/or trespassing. In general, the sediment cap remains in good condition. Shoreline sheen was not observed in 2016. Limited ebullition was observed primarily within the two areas of the sediment cap where granular organophilic clay is present.

3.2.1 Habitat Enhancement Features and Wildlife

Habitat enhancement features such as boulder clusters and sand cover as a biotic layer are design elements of the sediment cap. Large woody debris also provides habitat enhancement along the shoreline and in the Riparian Area above the shoreline. The distribution of sand cover over the ACB is similar to previous years. Originally, sand was placed over a large portion of the shoreline and Willamette Cove ACB armoring, but high river flow conditions and wake from passing boats have washed sand from the ACB where the bank slopes are steeper. Rounded gravel (1-1/2-inch-minus) was

placed within the ACB voids along a large portion of the shoreline and Willamette Cove in October 2012. The gravel has largely remained in place through 2016; however, some has washed down steeper shorelines and has settled onto lower ACB surfaces. Shoreline conditions and the distribution of the ACB gravel are shown in the Photograph Log (Appendix A).

Large driftwood along the shoreline at higher elevations are deposited during high river-stage events. The amount of driftwood moving through the site appears to remain fairly consistent every year. The highest river stage recorded since the sediment cap was installed occurred in June 2011, reaching 22 feet North American Vertical Datum (NAVD88), or 1 foot below the 23-foot flood stage. Erosion of soil mulch and vegetation cover on the green turf-reinforced matting (TRM) was observed in several areas near the lower riparian/ACB armoring elevation after river levels receded. During ACB gravel placement in October 2012, these areas were also repaired. TRM was pulled away from the ACB and voids were filled with crushed rock. The TRM was then pulled back over the crushed rock and re-secured to the ACB using concrete anchor nails. Additional repairs were made to 6 small areas of TRM along the shoreline in December 2015. The repairs continue to function as expected through 2016. The Willamette River did not reach flood stage in 2016 (24 feet NAVD88) with the maximum elevation at approximately 16 feet NAVD88 in March 2016.

Three areas of the shoreline appear to accumulate more woody debris than other areas:

- The south end of the shoreline near the City of Portland outfall;
- Along the shoreline near the former Tank Farm Area (TFA); and
- The north end of the site near the Burlington Northern Railroad bridge.

Boulder clusters placed during the sediment cap construction remained in place during 2016.

Numerous wildlife species continue to be observed site-wide; various birds seen most frequently include Canada geese, gulls, cormorants, pigeons, blue herons, ospreys, hawks (Photograph 7; Appendix A), and flickers.

3.2.2 Vandalism and Trespassing

The shoreline along the site and in the Willamette Cove is accessible and is used by the public for various forms of recreation. Throughout 2016, shoreline trash and graffiti were observed.

Numerous dilapidated boats (used as dwellings) were seen anchored in the Willamette Cove during every site visit (Photograph 8, Appendix A). Boats were not observed to be anchored on the sediment cap during site inspections. No effects to the sediment cap were observed from mooring or from physical contact with these boats on the sediment cap. The US Coast Guard and Oregon State Marine Board rules prohibit anchoring on the sediment cap.

3.2.3 Buoys

Five permanent buoys were installed in August 2011 along the perimeter of the sediment cap warning boaters of navigational hazards. Buoys were observed to be in place throughout 2016.

3.3 Sediment Cap Maintenance Activities

The sediment cap was designed to be generally maintenance free. Maintenance in 2016 only included one riparian vegetation watering event that occurred in August 2016 as discussed in Section 5.3.

3.4 Summary of Sediment Cap Remedy Performance

Overall, the sediment cap observations and inspections revealed no significant change in remedy performance or areas of concern. Future O&M activities primarily will consist of quarterly inspections and routine maintenance. Sediment cap porewater and surface water sampling was conducted in 2015 with results reported in the 2015 Annual Report and the Fourth Five-Year Review. Results indicated that the sediment cap is performing as designed. The next round of porewater and surface water sampling is scheduled to be conducted in 2020, before the 2021 Fifth Five-Year Review Report.

Sand covers the shoreline at lower, less steep elevations, and there are significant amounts of large driftwood have accumulated to help create wildlife habitat. Numerous wildlife species continue to be observed; various birds including Canada geese, gulls, cormorants, pigeons, blue herons, ospreys, and hawks were observed in 2016. The public frequents the shoreline for recreation, most commonly for walking dogs. Infrequent and minor instances of vandalism and littering have been noted. Rounded gravel used to fill voids within the ACB has created a more stable substrate for wildlife and a consistent and safer walking surface for public use, although much of the gravel has been eroded from the upper potions of the ACB.

4.0 GROUNDWATER PERFORMANCE STANDARDS AND ACTIVITIES

This section summarizes groundwater performance standards and activities for the reporting period January 1, 2016, through December 31, 2016. Groundwater remedy observations and maintenance activities were conducted according to the O&M Plan (HC/GSI 2016). Manual NAPL and groundwater level data were collected during the site-wide semiannual monitoring events conducted on June 27, 2016, and October 11, 2016.

4.1 Groundwater Performance Standards

The groundwater remedy consists of groundwater monitoring, NAPL recovery, a subsurface barrier wall surrounding approximately 18 acres beneath the footprint of the upland soil cap, and ICs. NAPL recovery was terminated by the EPA and DEQ in 2011 because the performance standard for NAPL recovery was met; recovery rates were minimal and remaining NAPL at the site does not pose a threat to the Willamette River. ICs have yet to be completed to restrict groundwater use at the site.

Groundwater within and outside of the subsurface barrier wall remains contaminated with metals, PCP, PAHs, dioxins, and NAPL. Contaminated groundwater within the barrier wall is contained and is not migrating to the river. Outside the barrier wall, residual product in soil within the Former Waste Disposal Area (FWDA) results in elevated concentrations of PCP and PAHs and the presence of localized NAPL in groundwater. Despite the groundwater contamination in this area, monitoring of

downgradient wells, surface water, and the sediment cap (inter-armoring, sub-armoring, and porewater in the organophilic clay) has demonstrated that the groundwater remedy is performing as designed and that groundwater is not adversely affecting the river.

The performance standards for the subsurface barrier wall are as follows.

- Maintain contaminant concentrations in shallow, downgradient compliance wells (or sediment porewater) below the alternate concentration limits (ACLs) set forth in the ROD (EPA 1996):
  - Arsenic (III): 1,000 µg/L
  - Chromium (III): 1,000 µg/L
  - Copper: 1,000 µg/L
  - Zinc: 1,000 µg/L
  - PCP: 5,000 µg/L
  - Total PAHs: 43,000 µg/L
  - Dioxins/furans: 0.2 ng/L
- Minimize the transport of NAPL and communication of groundwater zones across the subsurface barrier wall.
- Minimize visible discharge of creosote to the Willamette River.
- Maintain contaminant concentrations in the Willamette River below background concentrations or less than the sediment cap performance standards for surface water.

As discussed in Section 6 of the Second Five-Year Review Report (DEQ/EPA 2006), the EPA determined that ACLs were not valid as substitutes for the EPA's MCLs in groundwater. Because of this determination, the DEQ and EPA anticipate that amended groundwater cleanup goals for the site will be established in a ROD Amendment consistent with groundwater cleanup goals for the Portland Harbor Superfund Site ROD, which was issued In January 2017 (EPA, 2017). After new groundwater cleanup goals are established in a ROD Amendment, the Final O&M Plan will be revised to reflect the new cleanup goals.

4.2 Groundwater Flow Direction and Gradient Assessment

Manual NAPL and groundwater level data were collected during site-wide semiannual monitoring events conducted on June 27, 2016, and October 11, 2016; continuous water levels were also collected using dataloggers installed in selected monitoring wells. The current monitoring well network is shown on Figure 4-1. This section summarizes groundwater flow based on the 2016 water level measurements.

4.2.1 Horizontal Flow Direction and Gradients

Manual fluid measurements were collected during or immediately following low tide in the Willamette River. Shallow groundwater elevation contour maps were developed for each semiannual event during

what is typically the seasonal high (June) and low (October) river stage (Figures 4-2 and 4-3, respectively). Higher water levels were observed in December 2015 through May 2016 than those monitored in June, but the October 2016 monitoring event was coincident with the seasonal low river stage. The groundwater and NAPL elevation data are included in Table 4-1 (June 27, 2016) and Table 4-2 (October 11, 2016).

As shown in the shallow groundwater contour maps (Figures 4-2 and 4-3), the shallow horizontal groundwater gradient within the barrier wall is independent of the gradient outside the barrier wall. This demonstrates that the barrier wall has effectively cut off the hydraulic connection between the shallow groundwater zone inside and outside of the barrier wall. The groundwater gradient inside the barrier wall remains relatively flat (typically less than 0.002 foot per foot [ft/ft]) compared to the slightly steeper groundwater gradients (ranging from 0.002 ft/ft to 0.03 ft/ft) outside the barrier wall that are directed westerly toward the river and Willamette Cove. Previous water level measurements indicate when the Willamette River reaches approximately 12 to 15 feet NAVD88, which typically occurs during prolonged periods of regional rainfall and spring snowmelt, the gradient partially reverses within the barrier wall near MW-36s in the northwest corner. This is because of the deep hydraulic connection through sand at the base of the western edge of the barrier wall where the reversal in vertical gradient to an upward gradient when the river level exceeds the groundwater level within the barrier wall area. The Willamette River stage was lower than usual in June 2016 and a flow reversal within the barrier wall area was not observed. The gradient within the barrier wall area in June, with a 2.3-foot variation between MW-48s in the eastern end and MW-36s in the western end, was slightly less than (flatter) than the 3.1 foot variation in October.

Historical and annual hydrographs were prepared using the 30-minute pressure transducer data from paired monitoring wells located inside and outside the barrier wall as shown on Figures 4-4 through 4-11. The 11 site wells containing transducers are shown on Figure 4-1 and include two shallow and deep paired well clusters (MW-36s/37s, MW-36d/37d, MW-44s/45s, and MW-44d/45d) along the riverfront portion of the barrier wall, one shallow well pair (MW-52s/53s) on the upland side of the barrier wall, and one shallow interior well (EW-1s). The hydrographs compare water level elevations for selected well pairs to river stage elevation[1] and precipitation data[2]. The hydrographs show water levels in wells through the October 2016 semiannual monitoring event. Water level data beyond this date will be included in the 2017 Annual Report. Breaks in the monitoring well data are due to malfunctioning transducers, as further discussed in Section 4.4.

[1] River stage data were recorded every 30 minutes from US Geological Survey (USGS) station number 14211720 (USGS 2015a). This station is located on the upstream side of the Morrison Bridge (River Mile [RM] 12.8). River stage elevation data reported by the USGS are relative to the Portland River Datum at this location. The river stage data are corrected to NAVD88 at the site (approximately RM 7) by adding 5.001 feet to the USGS reading.

[2] Precipitation data shown on Figures 4-4 through 4-11 were obtained from the Astor Elementary School rain gauge located approximately 0.5 mile from the site. Daily totals were obtained from the City of Portland Hydra Network available on the USGS Web site (USGS 2015b).

The hydrographs document groundwater elevation differences and assess barrier wall performance over time. Clear differences in the groundwater elevations between shallow wells within, and directly outside of the barrier wall demonstrate that the barrier wall is effectively isolating the groundwater within the barrier wall.

4.2.2 Vertical Flow Direction and Gradients

Vertical gradients inside and outside the barrier wall along the Willamette River were observed in monitoring well clusters MW-36/MW-37 and MW-44/MW-45. The hydrographs for these wells (Figures 4-8 through 4-11) indicate that the deep groundwater zone is in direct hydraulic connection with the river. The deep zone both inside and outside of the barrier wall closely mimics the river stage, both in elevation and timing, with a small vertical gradient that varies upward and downward with the tidal changes. The exterior shallow wells, also in hydraulic connection with the river, show about a quarter cycle delay from river fluctuations and have dampened amplitude in comparison with the deeper wells.

The muted or nonexistent response of interior shallow wells compared with the deep zone wells suggests a clear hydraulic disconnect between the shallow aquifer within the barrier wall and the deeper water-bearing zones. The location where the response is greatest, but still significantly muted, is in well MW-36s (Figures 4-6 through 4-9), where a hydraulic connection exists at the base of the barrier wall. While a muted response of well MW-36s to changes in daily river stage elevation is still observed, water levels in the shallow interior wells MW-44s and EW-1s are virtually non-responsive to the daily changes in the Willamette River stage (Figures 4-10 and 4-11 for MW-44s, and Figures 4-6 and 4-7 for EW-1s). This reflects the presence of a confining silt layer between the shallow and intermediate zones near wells MW-44 and EW-1s.

Although precipitation in the Willamette River watershed ultimately affects the stage of the river, direct precipitation near the site appears to play a minor role in determining the water levels of wells within the barrier wall and along the river. The Resource Conservation and Recovery Act (RCRA)-style soil cap was designed to divert precipitation so that little infiltration occurs within the barrier wall. Although some infiltration occurs along the fringes of the soil cap and within the riparian zone, the volume of infiltration is minimal. Between the barrier wall and the river, precipitation inputs are vastly overshadowed by the response of groundwater to variations in river stage. The shallow zone up-gradient or cross-gradient from the barrier wall appears to react subtly to precipitation and is less connected to the river because of its distance from the river and the presence of the barrier wall, which is sealed into the underlying silt. One location where infiltration may influence groundwater elevation and flow path is in the retention pond (Figure 1-3) that receives diverted runoff from the soil cap. Historical water level data indicates that the groundwater gradient in this area is flat, and that there may be a slight groundwater mound east of the soil cap.

The hydrographs illustrate a net vertical gradient between the shallow and deep water-bearing zones, which continues to be slightly downward inside the barrier wall, similar to vertical gradients measured in 2008 through 2015. The net downward gradient is greater inside the barrier wall because the net shallow groundwater elevation inside the barrier wall continues to be slightly elevated compared to

the net river stage. The net vertical gradient outside the barrier wall on the river side is small and varies upward and downward according to the trends of the Willamette River. Neutral or upward vertical gradients occurred when the river stage was at a higher elevation for a prolonged period, which occurred several times between October 2015 and June 2016.

4.3 NAPL Gauging and Monitoring Assessment

Between February 1993 and April 2011, approximately 6,550 gallons of NAPL were extracted from site wells. Because recovery was slow and there was uncertainty about the benefits of ongoing recovery, a NAPL investigation in the FWDA outside the barrier wall (the remaining area with active NAPL recovery) was conducted in 2011. Based on the findings from the NAPL investigation (Dense Non-Aqueous Phase Liquid [DNAPL] Data Gap Investigation; HC/GSI 2011a) and extensive monitoring of the sediment cap (described in the Third Five-Year Review Report [DEQ/EPA 2011]), the DEQ and EPA decided to discontinue NAPL extraction on April 20, 2011. Subsequent monitoring of the post-extraction NAPL thickness in the FWDA was conducted in 2011 (HC/GSI 2011a), and the results supported the regulatory decision and confirmed that the residual NAPL in the FWDA is isolated and stable and does not pose a risk to the Willamette River. To confirm that this remains the case and to continue to evaluate the functional performance of the barrier wall and soil cap, NAPL presence and thickness continues to be monitored during the semiannual monitoring events.

Measurable quantities of NAPL were present in 12 site wells (EW-1s, EW-8s, EW-10s, EW-15s, EW-18s, EW-23s, MW-10r, MW-20i, MW-22i, MW-56s, MW-Ds, and MW-Gs) gauged semiannually in 2016. Figures 4-12 and 4-13 show the locations of wells that contained measurable quantities of light NAPL (LNAPL) and/or DNAPL for the June and October 2016 monitoring events, respectively. Tables 4-1 and 4-2 provide semiannual NAPL gauging measurements. Figures 4-14 through 4-24 show the NAPL and groundwater elevations versus time in individual wells that routinely contain NAPL. A NAPL thickness figure has not been prepared for well MW-10r because of the limited appearance of LNAPL in this well. The screened interval elevations and the well depth are also shown. The thickness of LNAPL can be calculated by subtracting the LNAPL elevation (when LNAPL is present) from the groundwater elevation. Similarly, the DNAPL thickness is represented by the difference between the DNAPL elevation and the well depth elevation.

Given that NAPL within the barrier wall is constrained laterally by the barrier wall, NAPL observations within and outside of the barrier wall are discussed separately below.

4.3.1 Outside the Barrier Wall

The only area where NAPL is observed routinely outside of the barrier wall is next to the northwest corner of the enclosure (Figure 1-3) that corresponds to the FWDA (Figure 1-5). In 2016, measurable quantities of DNAPL were observed in four wells (EW-10s, MW-20i, MW-Ds, and MW-Gs) in this area. As shown on Figures 4-14 through 4-17, the NAPL thicknesses measured in wells EW-10s, MW-20i, MW-Ds, and MW-Gs in 2016 are generally stable since NAPL recovery was discontinued in April 2011. This is consistent with historical observations and supports the conclusion that NAPL observed in the FWDA is localized and stable. There is no evidence of NAPL mobility either across the barrier wall or to the Willamette River.

4.3.2 Inside the Barrier Wall

During semiannual monitoring, measurable LNAPL was present in four wells (EW-15s, EW-23s, MW-10r, and MW-56s) within the barrier wall. Figures 4-18 through 4-20 show the elevation of LNAPL and shallow groundwater versus time in wells EW-15s, EW-23s, and MW-56s, respectively. As shown in these figures, the LNAPL thickness is generally greater when the groundwater elevation is low. This is the result of gravity drainage of LNAPL through the unsaturated zone when the water table drops. This pattern has been consistent since mid-2006 because LNAPL was not recovered inside of the barrier wall during this time (i.e., LNAPL thickness was not disturbed by recovery). Although the LNAPL thickness varies cyclically with changes in the groundwater elevation, the overall LNAPL thickness in these wells has remained relatively stable, with slight increases in monitoring wells EW-15s and EW-23s, when groundwater levels are low.

DNAPL was detected during the 2016 semiannual monitoring events within the barrier wall near the former TFA (see Figure 1-5 for TFA location) in wells EW-1s, MW-22i, EW-8s, and EW-18s, as shown on Figures 4-21 through 4-24, respectively. The DNAPL thickness in well EW-1s (Figure 4-21) has increased to a thickness of approximately 8 feet since mid-2011, after termination of a temporary recovery period in April 2011. The DNAPL thickness in well MW-22i is approximately 7 feet thick (Figure 4-22). Historically, DNAPL measurements in this well have been shown through extraction to be triggered by the presence of floating pin-sized globules of DNAPL and not a continuous layer of pure DNAPL. In well EW-8s, the DNAPL thickness has been generally stable since 2012, with about 2 feet of DNAPL observed in the sump of the well (Figure 4-23).

Overall, both LNAPL and DNAPL appear to be stable and there is no evidence of their mobility either across the barrier wall or to the Willamette River.

4.4 Groundwater Remedy Maintenance Activities

Table 4-3 provides the groundwater O&M activities conducted in 2016. Transducer data loggers were inspected during semiannual monitoring events in 2016 and in February 2016. Due to the age of the transducers on-site, transducer malfunctions have been increasing over time as can been seen in the data breaks in Figures 4-4 through 4-11. Over the past three years, all of the transducers used on the site have been replaced with new ones, with the last replacements made in 2016 as follows:

- February 4, 2016: MW-44s, MW-45s, MW-45d, and MW-52s
- March 31, 2016: EW-1s
- December 21, 2016: MW-37s and MW-44d.

The break in MW-52s data (Figure 4-5) occurred as a result of a programming error. The transducer was installed but did not start recording data and the problem was not realized until data was downloaded in the summer. Currently, all transducers at the site are functional and installed in the wells shown on Figure 4-1.

4.5 Summary of Groundwater Remedy Performance

Hydraulic conditions are consistent with previous years, verifying that the remedy continues to function as designed. Groundwater monitoring data are used to understand groundwater flow conditions inside and outside of the barrier wall. This information is evaluated to determine whether the barrier wall and impermeable RCRA-type soil cap are functioning as designed.

There was no measurable LNAPL in wells outside the barrier wall. DNAPL was measured in four wells outside the barrier wall. The DNAPL in these wells has remained stable with some variation due to temperature and pressure (i.e., water level variation). Based on the findings from the DNAPL Data Gap Investigation (HC/GSI 2011a), subsequent monitoring of the post-extraction NAPL thicknesses in wells in the FWDA, and extensive monitoring of the sediment cap (described in the Third Five-Year Review Report [DEQ/EPA 2011]) and groundwater, the decision to discontinue NAPL recovery is justified, and residual NAPL remaining in the FWDA does not pose a threat to the Willamette River.

Based on the evaluation of groundwater data from 2005 through 2016, the barrier wall and impermeable soil cap are functioning as designed to divert groundwater flow around and prevent rainwater infiltration into NAPL source areas contained within the barrier wall and NAPL contained within the barrier wall is prohibited from migrating to the Willamette River.

5.0 VEGETATION MANAGEMENT

This section summarizes the vegetation management and monitoring activities for the reporting period January 2016 through December 2016. Vegetation management activities on the upland cap were conducted in accordance with the McCormick & Baxter Vegetation Management Plan (HC/GSI 2011b).

The upland cap was constructed during a two-year period beginning in 2004 with the re-grading of the Willamette River bank. The 6-acre Riparian Area cap was installed and tied into the in-water sediment cap. In 2005, a 34-acre multiple-component designed soil cap was constructed to complete the upland cap. The City of Portland Bureau of Environmental Services (BES) entered into an Intergovernmental Agreement (IGA) with the DEQ to provide vegetation planning and vegetation management services for the upland cap from 2005 through 2010. In February 2006, the soil cap was planted with native grasses, plants, and trees, and an irrigation system was installed. After the fifth growing season, BES determined that the vegetation was fully established and the irrigation system was no longer needed.

Overall, the planting and vegetation management goals have been met. The irrigation system and piping had been inactive since 2009 and was decommissioned in December 2015. Semiannual noxious weed control activities, including herbicide application, were conducted from spring 2006 through spring 2013. Herbicide application was temporarily discontinued in June 2013 when nearby desirable native vegetation was observed to be stressed and dying. No herbicide was applied in 2014 or in 2015, but was resumed in 2016 after noxious weeds appeared to be spreading.

Rodents that inhabit the cap have damaged vegetation in the past; however, with the exception of some earlier targeted damage to the grand fir (*Abies grandis*) seedlings (BES 2010), there has been

insignificant damage to other plantings. Rodent activities are monitored during quarterly site inspections and were not observed to be causing significant damage during site visits in 2016.

5.1 Vegetation Management Components and Goals

The upland cap has five distinct components, each with corresponding goals and objectives for managing hydrology, soil, and wildlife habitat (Figure 5-1). These components are:

- Entrance Area;
- Impermeable Cap;
- Riparian Area;
- Stormwater Retention Pond and Drainage Swale; and
- Earthen Cap.

Performance standards to assess whether the planting goals in the DEQ/BES IGA for the entire upland cap are met include:

- Bare soil spaces are small and well dispersed;
- Soil movement, such as active rills or gullies and soil deposition around plants or in small basins, is absent or slight and local;
- Plant litter is well distributed and effective in protecting the soil with few or no litter dams present;
- Native woody and herbaceous vegetation, and germination micro-sites, are present and well distributed across the site;
- Vegetation structure results in rooting throughout the available soil profile;
- Plants have normal, vigorous growth form, and a high probability of remaining vigorous, healthy, and dominant over undesired competing vegetation;
- Stream banks have less than 5 percent exposed soil with margins anchored by deeply rooted vegetation or coarse-grained alluvial debris; and
- A continuous corridor of shrubs and trees provides shade for the entire stream bank.

Specific goals were set for planting the Riparian Area to create habitat, including elements such as large woody material, riparian vegetation for food, habitat cover and shelter, and shading (NOAA 2004).

5.2 Baseline Conditions

In 2010, the BES determined that the vegetation had been fully established, as discussed in its final 2010 Vegetation Management Report (BES 2010). Hart Crowser assumed responsibility for the vegetation management at that time. On June 10, 2011, a Hart Crowser ecologist inspected the upland

cap to confirm the vegetation conditions discussed in the report. The inspection included visual observation of vegetation planting areas, species identification (native, non-native, and invasive), growth, density, general coverage, and relative health of vegetation throughout the site. Photographic documentation of the inspection was completed to establish a baseline to evaluate the progress of future vegetation treatments and the qualitative observations at select site locations. These locations or "Photo Stations" are shown on Figure 5-1 and the photographs are provided in Appendix C, Vegetation Photographic Log. The following sections summarize the initial conditions and observations made during the baseline visit in June 2011.

5.2.1 Riparian Area

The Riparian Area is divided into two components: upper and lower. Each component received similar vegetation treatments (Photo Stations 8 and 9). The lower component is subject to Willamette River stage fluctuations, which influence vegetation conditions at its lower edge during high-water events.

Lower Component. The lower component originally was planted with a variety of native trees and shrubs including: Oregon ash (*Fraxinus latifolia*), black hawthorn (*Crataegus suksdorfii*), cascara (*Rhamnus purshiana*), hardhack (*Spiraea douglasii*), red-osier dogwood (*Cornus sericea*), Pacific ninebark (*Physocarpus capitatus*), swamp rose (*Rosa pisocarpa*), river willow (*Salix fluviatilis*), Sitka willow (*Salix sitchensis*), rigid willow (*Salix rigida*), Piper's willow (*Salix piperi*), and black twinberry (*Lonicera involucrata*). Groundcover species planted in the lower component included: California brome (*Bromus carinatus*), blue wildrye (*Elymus glaucus*), meadow barley (*Hordeum brachyantherum*), slender hairgrass (*Deschampsia elongata*), spike bentgrass (*Agrostis exerata*), globe gilia (*Gilia capitata*), lupine (*Lupinus albicaulis*), and Canada goldenrod (*Solidago canadensis*). Tree plantings were not installed at lower elevations in the lower component of the Riparian Area because of the potential for late season inundation from high river levels. Instead, appropriate shrubs, primarily willows, were installed along the lower edge of this component to provide food and shade. A significant quantity of large woody debris was observed along the entire length of the lower edge. Trees and shrubs within the lower component were observed to be well established and growing both vertically and laterally. No indications of stress were noted. Localized areas of exposed TRM were observed along the length of the lower edge of the TRM, likely because of river fluctuations and movement of large woody debris along the shoreline. Thistle (*Cirsium arvense*) was the most common noxious weed with lesser quantities of knapweed (*Centaurea Sp.*) and butterfly bush (*Buddleia davidii*) present.

Upper Component. The upper component was planted with native vegetation including: red alder (*Alnus rubra*), big-leaf maple (*Acer macrophyllum*), Western red cedar (*Thuja plicata*), madrone (*Arbutus menziesii*), grand fir, Garry oak (*Quercus garryana*), Oregon ash, black hawthorn, cascara, red elderberry (*Sambucus racemosa*), blue elderberry (*Sambucus cerulea*), Nootka rose (*Rosa nutkana*), tall Oregon-grape, snowberry (*Symphoricarpos albus*), red-flowering currant (*Ribes sanguineum*), oceanspray (*Holodiscus discolor*), red-osier dogwood, twinberry, and Pacific ninebark. Groundcover species in the upper component are identical to those in the lower component. Similar to the lower component, trees and shrubs were well established and appeared healthy. Trees were 6 to 12 feet tall. Few areas containing bare ground were observed. Thistle and knapweed were present in small quantities among the groundcover plantings throughout the upper component.

Summary. In general, the Riparian Area components appeared to be performing well, with the installed trees and shrubs looking healthy and spreading. Groundcover species provided relatively good coverage of the soil, with the exception of a few areas containing bare ground and observed TRM along the shoreline. In addition, large driftwood was present throughout the lower component and in smaller quantities within the upper component. Thistle, knapweed, and butterfly bush continue to grow within the Riparian Area.

5.2.2 Upland Area

The Upland Area is divided into three components—the earthen cap, the stormwater retention pond/drainage swale, and the impermeable cap (Figure 5-1). A variety of native trees, shrubs, and herbaceous species are present on the earthen cap as shown in photos taken at Photograph Locations 1, 2, 3, and 5 (Appendix C). Native shrubs and herbaceous species are present in the stormwater retention pond/drainage swale (Photo Station 4, Appendix C). Meadow grasses and herbs are present on the impermeable cap (Photograph Location 6, Appendix C).

Earthen Cap Component. Originally, this component was planted with a variety of native trees, shrubs, and grasses including: Garry oak, Ponderosa pine (*Pinus ponderosa*), black hawthorne (*Crataegus douglasii*), madrone, snowberry, blue elderberry (*Sambucus cerulea*), Oregon-grape (*Mahonia aquifolium*), Nootka rose, red-flowering currant, oceanspray, serviceberry (*Amelanchier alnifolia*), and mock orange (*Philadelphus lewisii*). Herbaceous species installed on the earthen cap included chewings fescue (*Festuca rubra var. comutata*), California brome, meadow barley, slender hairgrass, Spanish clover (*Lotus purshiana*), claria (*Clarkia amoena*), globe gilia, meadow checkermallow (*Sidalcea campestris*), large-leaved lupine (*Lupinus polyphullus*), and Canada goldenrod. Nearly all of these plant varieties remain on the earthen cap and appear to be well established and growing both vertically and laterally. Nootka rose had dominated the northwest corner of the earthen cap component; however, some of the Nootka rose appeared to have been highly stressed or had died, and most were regenerating. The black hawthorn had grown to 6 to 8 feet tall. Localized areas of moss were observed within the grasses and herbaceous vegetation. Small quantities of knapweed and thistle were also present.

Stormwater Retention Pond/Drainage Swale Component. This component was planted with a native shrub overstory consisting of hardhack, Sitka willow, and Piper's willow (Photograph 4, Appendix C). Volunteer red alder and black cottonwood (*Populus balsamifera*) were observed among the shrub plantings. Understory herbaceous species were planted in the pond and swale area based on anticipated inundation within the pond and swale area and included: water plantain (*Alisma plantago aquatica*), slough sedge (*Carex obnupta*), soft stem bulrush (*Scirpus tabernaemontanii*), small-fruited bulrush (*Scirpus microcarpus*), Western sloughgrass (*Beckmania syzigachne*), Western mannagrass (*Glyeria occidentalis*), tufted hairgrass (*Deschapsia cespitosa*), slender hairgrass, meadow barley, spike bentgrass, meadow foxtail (*Alopecuris geniculatus*), self heal (*Prunella vulgaris*), Spanish clover, and gumweed (*Grindelia integrifolia*). The shrub plantings in the pond and swale area were well established and appeared healthy. Many of the grasses and herbs in the pond area did not survive because the infiltration of surface runoff limits moisture and the understory is dominated by sand and bare ground. Given that the shrubs were well established, the area is flat, and erosion generally was

not occurring, replanting grasses and herbs was not recommended. No noxious weeds were observed in this component.

Impermeable Cap Component. This component was seeded with a grassland mixture including: chewings fescue, California brome, meadow barley, slender hairgrass, large-leaved collomia (*Collomia grandiflora*), globe gilia, large-leaved lupine, and Canada goldenrod. Grassland species provided excellent cover of the impermeable cap. Moss was present in localized areas where grasses and herbs did not become established. Small quantities of knapweed, thistle, skeletonweed (*Chondrilla juncea*), and dandelion (*Taraxacum officinale*) were present within the southwestern portion of this component and did not appear to be encroaching on desirable vegetation.

Summary. In general, the Upland Area appeared to be performing well in 2011 (baseline conditions) with the installed trees and shrubs looking healthy and spreading on the earthen cap component, shrubs well established within the stormwater retention pond/drainage swale component, and good soil coverage and vegetative diversity on the impermeable cap component. Groundcover species provided excellent coverage of the ground, with the exception of a few sections containing bare ground and the relatively bare understory in the pond area. Limited quantities of noxious weeds were observed in the Upland Area and were primarily limited to the southwestern edge of the impermeable cap component.

5.3 Vegetation Observations

On June 30 and October 28, 2016, a Hart Crowser ecologist inspected the upland cap to assess the current conditions as compared to the baseline conditions observed in June 2011. Qualitative data were recorded on species composition, cover and density of vegetation, growth and vigor, and effectiveness of previous noxious weed treatments. The Photograph Log shows select Photo Stations during the June 2016 inspection and are paired with photographs from the June 2011 baseline inspection for a qualitative assessment of the site. Photo Stations are shown on Figure 5-1. Observations are summarized below.

5.3.1 Riparian Area

Lower Component. Trees and shrubs in the lower component were observed to be well established and growing both vertically and laterally. Many of the trees and shrubs planted in this area have reached a height of 9 to 20 feet. The area has good grass coverage and no barren areas were visible. As the tree species continue to develop, they will increase shading along the shoreline of the river. Most of the deciduous trees appear healthy and recovered well from last summer's drought, although a few stressed maple trees were observed. The conifers that survived from last year appear healthy and are thriving. Shrubs planted during the TRM repairs in December 2015 were observed to be stressed and many had perished, but groundcover is returning to the area following placement of the mulch and soil beneath the TRM.

The spring herbicide application was successful at treating the scotch broom (*Cytisus scoparius*) and Canada thistle (*Cirsium arvense*); however, Saint John's Wort (*Hypericum perforatum*) was still

observed near the shoreline and thistle was still common in the lower portion of the Riparian. An herbicide applications is planned for spring 2017.

Localized areas of exposed TRM are still visible along the length of the lower edge of the TRM, but grasses and weeds are beginning to infill the areas following the December 2015 repairs. A significant quantity of large driftwood was observed along the entire length of the lower component of the Riparian Area in June and October 2016.

Upper Component. Native trees and shrubs in the upper component appeared to be recovering following the 2015 drought. Grand fir, Ponderosa pine, madrone, Nootka rose, snowberry, Oregon-grape, Douglas Hawthorne, and elderberry appeared well established and performing best within this component. Following a period of dry weather in August, approximately 2,500 gallons of water were applied to the riparian area on August 26, 2016. The water was applied to avoid excessive late season drought stress that was experienced in 2015.

Volunteer Madrones and live oak were present along the fence and appear to be thriving. Individual plants, including oceanspray, cascara, twinberry, and Pacific ninebark, appeared to be recovering well. Groundcover plantings also appeared healthy and fewer weeds were observed; however, thistle and St. John's Wort were still present.

Summary. In general, the upper and lower components appeared to be performing well with the trees and shrubs largely recovering following the 2015 drought. Few, if any, trees were lost as a result of summer weather in 2016. Groundcover species are providing good coverage of the site soils; no areas of bare ground were observed. In general, the canopy in the north portion of the Riparian area is much denser when compared to the south.

Many of the new shrubs planted in December 2015 did not survive, which was not unexpected given that the area is relatively dry and the irrigation system has been decommissioned. Regular manual watering of the plants would not have been cost effective. The primary goal of the repairs; however, was to stabilize the TRM, which appears to have been successful. Large driftwood continues to accumulate along the shoreline to the middle of the bank near the break between the upper and lower components (Photographs 7 and 9, Appendix C). This large driftwood provides habitat for birds, small mammals, and other wildlife using this portion of the site.

Thistle, knapweed, and butterfly bush continue to grow in the Riparian Area, but their abundance was significantly reduced by the spring herbicide application. The spring 2017 weed control event should greatly diminish the weed populations and suppression activities may not be needed in subsequent years.

5.3.2 Upland Area

Earthen Cap Component. Tree and shrub plantings on the earthen cap were healthy and growing well (Photographs 2, 3, and 5, Appendix C). Ponderosa pine, Oregon grape, elderberry, and serviceberry were performing the best. Nootka rose dominated the northwest portion of the earthen cap and were previously stressed, but have recovered well. Trees and shrubs ranged in height from approximately 6

to 15 feet. Herbaceous species provided full coverage of the ground. During our June 2016 site visit, gumweed, mullein, and goldenrod (native plant) and various grasses were frequently observed throughout earthen cap. No indications of significant stress were observed and oak tress appear to have recovered following the 2015 drought. Localized areas of moss were observed in the herbaceous layer. Weeds including false dandelion and St. John's wort were observed and should be treated during the 2017 herbicide application.

Stormwater Retention Pond/Drainage Swale Component. Vegetation in the drainage swale area was well established and appeared healthy, but most shrubs were either highly stressed or dead within the stormwater retention pond and riprap-lined outlet (Photograph 5, Appendix C). Red-osier dogwood volunteers were observed within the northwest portion of the swale. Sitka willow had grown to 10 to 15 feet tall, and the Piper's willow were 6 to 8 feet tall. Volunteer cottonwoods were observed to range from 20 to 25 feet tall. Alder and willow were present and expanding around the periphery of the stormwater retention pond, but some dead and stressed shrubs were observed in the pond and its outlet (Photograph 4, Appendix C). Most of the herbaceous and emergent plantings in this component did not survive because of the sandy nature of the soil, which does not provide adequate moisture retention and inundation to support all of the originally installed plant species during the dry months of the year. Various grasses make up the bulk of the groundcover in the retention pond.

Impermeable Cap Component. The grassland species on the impermeable cap provided excellent coverage of the ground (Photograph 6, Appendix C). Gumweed was observed along the southwestern edge of the impermeable cap and provides increased diversity in this area. The remaining grasses and herbs were thriving. The spring 2017 herbicide treatment should address the remaining limited quantities of knapweed, thistle, and skeletonweed that were observed within the western portion of this component.

Summary. The Upland Area components were performing well with the exception of small areas of alder and willow in the stormwater retention pond and its riprap-lined outlet channel. Groundcover (herbaceous) species provided excellent coverage of the ground with the exception of a few areas containing bare ground and the relatively bare understory in the pond area. Noxious weed density decreased following the spring herbicide application, but additional treatments will be needed to prevent future spreading.

5.4 Vegetation Maintenance Activities

This section describes activities conducted to maintain vegetation in 2016. The general planting goals (NOAA 2004) continue to be met.

5.4.1 Noxious Weed Control

A preventive control approach continues to be implemented as part of an ongoing effort to control the spread of noxious weed species. Spot spraying was last completed over the entire site in April and May 2016. This was the first weed suppression effort since June 2013. Vegetation inspections in June and October found that noxious weed populations had been reduced, but the follow-up treatments would

be needed to control St John's Wort and thistle that was still observed throughout the site. Another weed control event is planned for spring 2017.

5.4.2 Irrigation

Irrigation was suspended in 2011 and the system decommissioned in the spring of 2015. Due to exceptionally dry conditions during spring and summer 2015, irrigation water was applied throughout the upper and lower Riparian Areas to help alleviate stressed vegetation. The 2016 summer was not as hot and dry, but as a precautionary measure, one watering event was completed on August 26, 2016, when 2,500 gallons of water were applied to the Riparian Area following a stretch of hot weather. The watering targeted all stressed trees and shrubs, although greater emphasis was placed on the vegetation that appeared to be the most stressed and areas were vegetation perished in 2015, which included Oregon ash, red osier dogwood, and nootka rose.

In 2011, it was not anticipated that further irrigation would be needed beyond the five year post-planting period. It is anticipated that additional irrigation water may be needed in 2017, particularly if the site is subject to similar drought conditions as experienced in 2015. It will be particularly important to provide water to the new shoreline plantings and prevent further loss of conifers. The water tank trailer and firehose worked well to apply water throughout the site and this same technique could be used again, if needed. Conditions will be monitored during the summer months and, if dry conditions are prevalent, another drought assessment survey will be conducted to determine if additional watering is needed.

5.5 Vegetation Performance Summary

Overall, the tree, shrub, and groundcover plantings are performing well throughout the site. Although alder and willow are present along the periphery, much of the stormwater retention pond remains barren. Groundcover species provide excellent coverage over much of the site. Noxious weed coverage was reduced by the spring herbicide application, but ongoing management will likely be needed to control and prevent them from colonizing larger areas.

The exceptionally dry summer conditions in 2015 resulted in significant stress of the riparian community and other localized habitats across the site. Vegetation appeared to recover in 2016, although several conifers in the upper Riparian Area did not survive (Photograph 9; Appendix A). It is likely that some of the mortality was the result of natural competition for water and nutrients, that was acerbated by the 2015 summer drought. Although some conifers were lost, the remaining trees should face less competition, which will help them thrive. Vegetation monitoring will continue to be performed during summer 2017 and additional watering will be provided as needed to help ensure survival of the plantings.

6.0 SUMMARY OF OVERALL REMEDY PERFORMANCE

Overall, the 2016 soil and sediment cap observations and inspections and groundwater monitoring revealed no significant change in remedy performance or areas of concern. The remedy continues to perform as designed and is protective of human health and the environment.

7.0 SUMMARY OF PLANNED ACTIVITIES FOR 2017

The Final O&M Plan with descriptions of O&M activities and schedule for the next five years was completed by the DEQ with assistance from EPA, GSI, and Hart Crowser in March 2014.

Table 7-1 presents the soil cap O&M activities planned through 2021. Soil cap O&M activities in 2017 will consist primarily of quarterly inspections and routine maintenance. Semiannual inspections should be continued in 2017 to assess and monitor vegetation planting areas, species identification (native, non-native, and invasive), growth, density, and general coverage throughout the site. Noxious weed control activities will be completed in spring 2017 to maintain a thriving and functional riparian habitat. The two job trailers were removed in February 2017 and removal of the leftover ACB might also be considered.

Table 7-2 presents the sediment cap O&M activities planned through 2021. In 2017, activities are expected to include quarterly inspections, routine maintenance, and possibly a beach litter cleanup.

The frequency of the groundwater monitoring activities through September 2021 are summarized in Table 7-3. The next groundwater quality sampling event will occur in 2020. Routine maintenance of the data logger transducers are also included as elements of groundwater O&M.

8.0 REFERENCES

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F:\Notebooks\1567010_DEQ McCormick & Baxter O&M\Deliverables\Reports\2016 Annual Report\DEQ McCormick & Baxter_2016 Annual Report_20170323.docx

Table 2-1: Soil Cap O&M Activities in 2016
2016 O&M Annual Report
McCormick and Baxter Superfund Site

O&M Activity	Frequency in 2016
Visual Inspections:	
Cap surface	January, April, July, November
Subsidence near EW-1s	January, April, July, November
Stormwater conveyance system	January, April, July, November
Security fencing	January, April, July, November
Warning signs	January, April, July, November
Abundance and survival of vegetation	January, April, June, July, October, November
Routine Maintenance and Monitoring:	
Manual removal of invasive plant	None
Targeted application of herbicides	April and May
Non-Routine Maintenance:	
Riparian area water events	August
Filling of potential animal burrow into the earthen cap	Periodically along fence
Utilities Service:	
Water, electric, phone, alarm, solid waste, toilet	September (Backflow Testing)

Table 3-1: Sediment Cap O&M Activities in 2016
2014 O&M Annual Report
McCormick and Baxter Superfund Site

O&M Activity	Frequency in 2016
Visual Inspections (from shore):	
Warning buoys	January, April, July, November
Cap surface	January, April, July, November
Habitat quality	January, April, June, July, October, November
Routine Monitoring:	
Water column and inter-armoring water sampling	None
Organoclay core sampling	None
Non-Routine Monitoring:	
Multibeam bathymetric surveys, side-scan sonar survey	None
Non-Routine Maintenance:	
Cut ACB cable loops	Periodically

Table 4-1 - Groundwater and NAPL Elevations: June 27, 2016
2016 O&M Annual Report
McCormick and Baxter Superfund Site

Well ID	Date	Time	Measuring Point Elevation (ft NAVD88)	Depth to LNAPL (ft)	Depth to water (ft)	Depth to DNAPL (ft)	LNAPL Thickness (ft)	DNAPL Thickness (ft)	Groundwater Elevation LNAPL Corrected (ft NAVD88)
EW-1s	6/27/2016	11:20	40.1		25.9	39.9		8.1	14.2
EW-2s	--	--	42.4		NM				--
EW-8s	6/27/2016	11:55	40.5		26.7	52.6		2.1	13.7
EW-10s	6/27/2016	9:20	29.4		20.2	40.0		2.6	9.2
EW-15s	6/27/2016	10:35	43.0	30.7	33.3		2.6		12.3
EW-18s	6/27/2016	11:40	40.7		27.0	42.7		1.9	13.7
EW-19s	6/27/2016	9:00	25.9		16.5				9.5
EW-23s	6/27/2016	10:10	37.6	25.9	30.5		4.7		11.7
MW-1r	6/27/2016	12:15	37.6		24.7				12.9
MW-7 WC[a]	--	--	36.7		NM				--
MW-10r	6/27/2016	10:55	41.9	28.1	28.6		0.5		13.7
MW-15s	6/27/2016	9:52	43.3		29.9				13.4
MW-17s	6/27/2016	10:01	41.3		28.1				13.2
MW-20i	6/27/2016	9:40	41.4		32.4	71.1		3.6	9.0
MW-22i	6/27/2016	11:00	42.3		32.7	51.4		7.6	9.5
MW-23d	6/27/2016	11:16	41.1		30.7				10.3
MW-32i	6/27/2016	11:12	39.3		26.4				12.9
MW-34i	6/27/2016	10:04	32.7		23.3				9.3
MW-35r	6/27/2016	9:01	32.3		21.7				10.5
MW-36d	6/27/2016	9:21	30.5		21.4				9.0
MW-36i	6/27/2016	9:18	30.2		21.2				9.0
MW-36s	6/27/2016	9:15	30.7		18.9				11.9
MW-37d	6/27/2016	9:31	26.1		17.0				9.1
MW-37i	6/27/2016	9:29	25.9		16.8				9.0
MW-37s	6/27/2016	9:26	24.9		15.6				9.3
MW-38d	6/27/2016	9:47	31.8		22.6				9.3
MW-38i	6/27/2016	9:49	32.1		23.0				9.1
MW-38s	6/27/2016	9:51	32.3		20.2				12.1
MW-39d	6/27/2016	10:08	29.8		20.5				9.4
MW-39i	6/27/2016	10:05	30.1		20.8				9.3
MW-39s	6/27/2016	9:57	29.8		20.4				9.3
MW-40d	6/27/2016	10:49	28.7		19.1				9.6
MW-40i	6/27/2016	10:47	28.7		19.5				9.3
MW-40s	6/27/2016	10:41	28.3		15.6				12.7
MW-41d	6/27/2016	10:52	27.4		17.9				9.6
MW-41i	6/27/2016	10:55	27.1		17.6				9.5
MW-41s	6/27/2016	10:59	27.8		18.5				9.3
MW-42d	6/27/2016	11:09	32.2		22.6				9.6
MW-42i	6/27/2016	11:11	32.7		23.1				9.6
MW-42s	6/27/2016	11:14	32.4		19.0				13.4
MW-43d	6/27/2016	11:18	28.3		18.7				9.7
MW-43i	6/27/2016	11:21	30.3		20.7				9.6
MW-43s	6/27/2016	11:25	31.1		21.7				9.3
MW-44d	6/27/2016	11:44	29.6		19.6				10.1
MW-44i	6/27/2016	11:51	29.3		20.0				9.4
MW-44s	6/27/2016	11:47	29.6		16.0				13.6
MW-45d	6/27/2016	11:39	27.9		18.1				9.8
MW-45i	6/27/2016	11:42	28.0		18.4				9.6
MW-45s	6/27/2016	11:35	28.2		18.8				9.4
MW-46s	6/27/2016	12:27	35.5		21.8				13.7
MW-47s	6/27/2016	12:31	35.5		25.8				9.7
MW-48s	6/27/2016	12:58	38.7		24.5				14.2
MW-49s	6/27/2016	12:55	37.6		19.2				18.4

Table 4-1 - Groundwater and NAPL Elevations: June 27, 2016
2016 O&M Annual Report
McCormick and Baxter Superfund Site

Well ID	Date	Time	Measuring Point Elevation (ft NAVD88)	Depth to LNAPL (ft)	Depth to water (ft)	Depth to DNAPL (ft)	LNAPL Thickness (ft)	DNAPL Thickness (ft)	Groundwater Elevation LNAPL Corrected (ft NAVD88)
MW-50s	6/27/2016	10:35	39.3		25.2				14.1
MW-51s	6/27/2016	10:36	39.5		21.0				18.6
MW-52s[b]	7/21/2016	12:43	40.7		27.3				13.4
MW-53s[b]	7/21/2016	12:48	40.4		23.6				16.8
MW-54s	6/27/2016	9:35	41.8		28.2				13.6
MW-55s	6/27/2016	9:35	41.0		26.6				14.4
MW-56s	6/27/2016	10:45	43.5	30.9	31.8		0.9		12.6
MW-57s	6/27/2016	9:46	42.0		31.4				10.7
MW-58d	6/27/2016	8:58	41.4		32.3				9.1
MW-58i	6/27/2016	8:57	41.0		32.1				8.9
MW-58s	6/27/2016	8:56	41.5		31.7				9.8
MW-59s	6/27/2016	12:41	35.9		20.9				15.0
MW-60d	6/27/2016	9:05	40.1		31.1				9.0
MW-61s	6/27/2016	9:20	43.6		28.6				15.0
MW-62i	6/27/2016	9:57	42.6		33.3				9.3
MW-As	6/27/2016	11:11	39.3		21.4				17.9
MW-Ds	6/27/2016	9:55	42.9		32.8	36.5		2.2	10.1
MW-Gs	6/27/2016	9:30	40.2	30.0	30.0	42.6	Trace	2.1	10.1
MW-Os	6/27/2016	10:42	40.9		22.4				18.6
PW-1d	6/27/2016	10:44	44.0		31.2				12.8
PW-2d	6/27/2016	10:40	41.8		28.9				12.9

NM = not measured
LNAPL specific gravity estimated as 0.981 g/cm^3
Corrected groundwater elevation = [LNAPL thickness * LNAPL specific gravity] + groundwater
[a]Unable to access MW-7 WC.

Table 4-2 - Groundwater and NAPL Elevations: October 11, 2016
2016 O&M Annual Report
McCormick and Baxter Superfund Site

Well ID[a]	Date	Time	Measuring Point Elevation (ft NAVD88)	Depth to LNAPL (ft)	Depth to water (ft)	Depth to DNAPL (ft)	LNAPL Thickness (ft)	DNAPL Thickness (ft)	Groundwater Elevation LNAPL Corrected (ft NAVD88)
EW-1s	10/11/2016	11:15	40.1		27.4	39.8		8.2	12.7
EW-2s	10/18/2016	14:15	42.4		32.0				10.3
EW-8s	10/11/2016	11:30	40.5		28.4	52.8		1.9	12.1
EW-10s	10/11/2016	9:05	29.4		22.4	41.5		1.2	7.0
EW-15s	10/11/2016	10:25	43.0	32.8	41.4	48.7	8.6	Trace	10.1
EW-18s	10/11/2016	11:45	40.7		27.6	42.7		2.0	13.1
EW-19s	10/11/2016	8:45	25.9		18.4				7.6
EW-23s	10/11/2016	10:15	37.6	27.9	35.3		7.4		9.6
MW-1r	10/11/2016	12:00	37.6		27.4				10.2
MW-7 WC[a]	--	--	36.7		NM				--
MW-10r	10/11/2016	10:50	41.9	29.8	30.2		0.4		12.1
MW-15s	10/11/2016	12:31	43.3		31.5				11.7
MW-17s	10/11/2016	12:44	41.3		29.8				11.5
MW-20i	10/11/2016	9:40	41.4	35.0	35.0	71.2	Trace	3.5	6.5
MW-22i	10/11/2016	11:00	42.3		35.2	52.1		6.9	7.1
MW-23d	10/11/2016	12:47	41.1		33.3				7.7
MW-32i	10/11/2016	12:14	39.3		29.1				10.3
MW-34i	10/11/2016	12:35	32.7		25.7				6.9
MW-35r	10/11/2016	12:59	32.3		23.9				8.4
MW-36d	10/11/2016	9:26	30.5		23.9				6.5
MW-36i	10/11/2016	9:23	30.2		23.6				6.6
MW-36s	10/11/2016	9:21	30.7		20.8				9.9
MW-37d	10/11/2016	9:38	26.1		19.7				6.4
MW-37i	10/11/2016	9:36	25.9		19.5				6.4
MW-37s	10/11/2016	9:33	24.9		17.5				7.3
MW-38d	10/11/2016	9:55	31.8		25.3				6.5
MW-38i	10/11/2016	9:59	32.1		25.3				6.8
MW-38s	10/11/2016	9:59	32.3		22.3				10.0
MW-39d	10/11/2016	10:06	29.8		23.4				6.5
MW-39i	10/11/2016	10:04	30.1		23.6				6.4
MW-39s	10/11/2016	10:02	29.8		22.4				7.4
MW-40d	10/11/2016	10:18	28.7		22.2				6.4
MW-40i	10/11/2016	10:20	28.7		22.0				6.7
MW-40s	10/11/2016	10:22	28.3		17.9				10.4
MW-41d	10/11/2016	10:28	27.4		21.0				6.4
MW-41i	10/11/2016	10:26	27.1		20.6				6.5
MW-41s	10/11/2016	10:24	27.8		20.4				7.4
MW-42d	10/11/2016	10:47	32.2		25.8				6.4
MW-42i	10/11/2016	10:45	32.7		26.2				6.5
MW-42s	10/11/2016	10:43	32.4		20.7				11.7
MW-43d	10/11/2016	10:55	28.3		21.9				6.5
MW-43i	10/11/2016	10:53	30.3		23.9				6.5
MW-43s	10/11/2016	10:51	31.1		24.0				7.0
MW-44d	10/11/2016	11:07	29.6		22.7				6.9
MW-44i	10/11/2016	11:03	29.3		22.6				6.7
MW-44s	10/11/2016	11:01	29.6		17.5				12.1
MW-45d	10/11/2016	11:14	27.9		21.3				6.6
MW-45i	10/11/2016	11:12	28.0		21.4				6.6
MW-45s	10/11/2016	11:10	28.2		20.8				7.4
MW-46s	10/11/2016	11:33	35.5		23.4				12.1
MW-47s	10/11/2016	11:36	35.5		27.9				7.6
MW-48s	10/11/2016	12:12	38.7		25.7				13.0
MW-49s	10/11/2016	12:10	37.6		22.1				15.5

Table 4-2 - Groundwater and NAPL Elevations: October 11, 2016
2016 O&M Annual Report
McCormick and Baxter Superfund Site

Well ID[a]	Date	Time	Measuring Point Elevation (ft NAVD88)	Depth to LNAPL (ft)	Depth to water (ft)	Depth to DNAPL (ft)	LNAPL Thickness (ft)	DNAPL Thickness (ft)	Groundwater Elevation LNAPL Corrected (ft NAVD88)
MW-50s	10/11/2016	12:50	39.3		26.4				12.9
MW-51s	10/11/2016	12:52	39.5		23.9				15.6
MW-52s	10/11/2016	11:45	40.7		28.7				12.0
MW-53s	10/11/2016	11:46	40.4		25.7				14.7
MW-54s	10/11/2016	12:25	41.8		29.8				11.9
MW-55s	10/11/2016	12:27	41.0		24.4				16.6
MW-56s	10/11/2016	10:35	43.5	32.9	33.7		0.8		10.6
MW-57s	10/11/2016	12:29	42.0		33.6				8.5
MW-58d	10/11/2016	--	41.4		34.3				7.2
MW-58i	10/11/2016	--	41.0		34.0				7.0
MW-58s	10/11/2016	12:48	41.5		33.8				7.7
MW-59s	10/11/2016	12:00	35.9		23.6				12.3
MW-60d	10/11/2016	9:15	40.1		33.5				6.6
MW-61s	10/11/2016	13:04	43.6		32.2				11.4
MW-62i	10/11/2016	12:40	42.6		35.6				7.0
MW-As	10/11/2016	12:15	39.3		22.6				16.7
MW-Ds	10/11/2016	10:00	42.9	35.0	35.0	36.4	Trace	2.3	7.9
MW-Gs	10/11/2016	9:20	40.2	32.4	32.4	42.7	Trace	2.0	7.7
MW-Os	10/11/2016	12:58	40.9		25.2				15.7
PW-1d	10/11/2016	13:00	44.0		33.8				10.2
PW-2d	10/11/2016	12:55	41.8		31.5				10.3

LNAPL specific gravity estimated as 0.981 g/cm^3

Corrected groundwater elevation = [LNAPL thickness * LNAPL specific gravity] + groundwater

Table 4-3: Groundwater O&M Activities in 2016
2016 O&M Annual Report
McCormick and Baxter Superfund Site

O&M Activity	Frequency in 2016
NAPL Monitoring:	
Manual gauging of site wells	June, October
Groundwater Monitoring:	
Downloading continuous water level data from transducers	January, June, October
Manual water level measurements from site wells	June, October
Routine Maintenance of Equipment:	
Transducers Data Download	June, October
Replaced 4 Transducers (MW-44s, MW-45s, MW-45d, and MW-52s)	February
Replace malfunctioning EW-1s transducer	March
Replace 2 Transducers (MW-37s and MW-44d)	December

Table 7-1: Soil Cap O&M Activities Planned through 2021
2016 O&M Annual Report
McCormick and Baxter Superfund Site

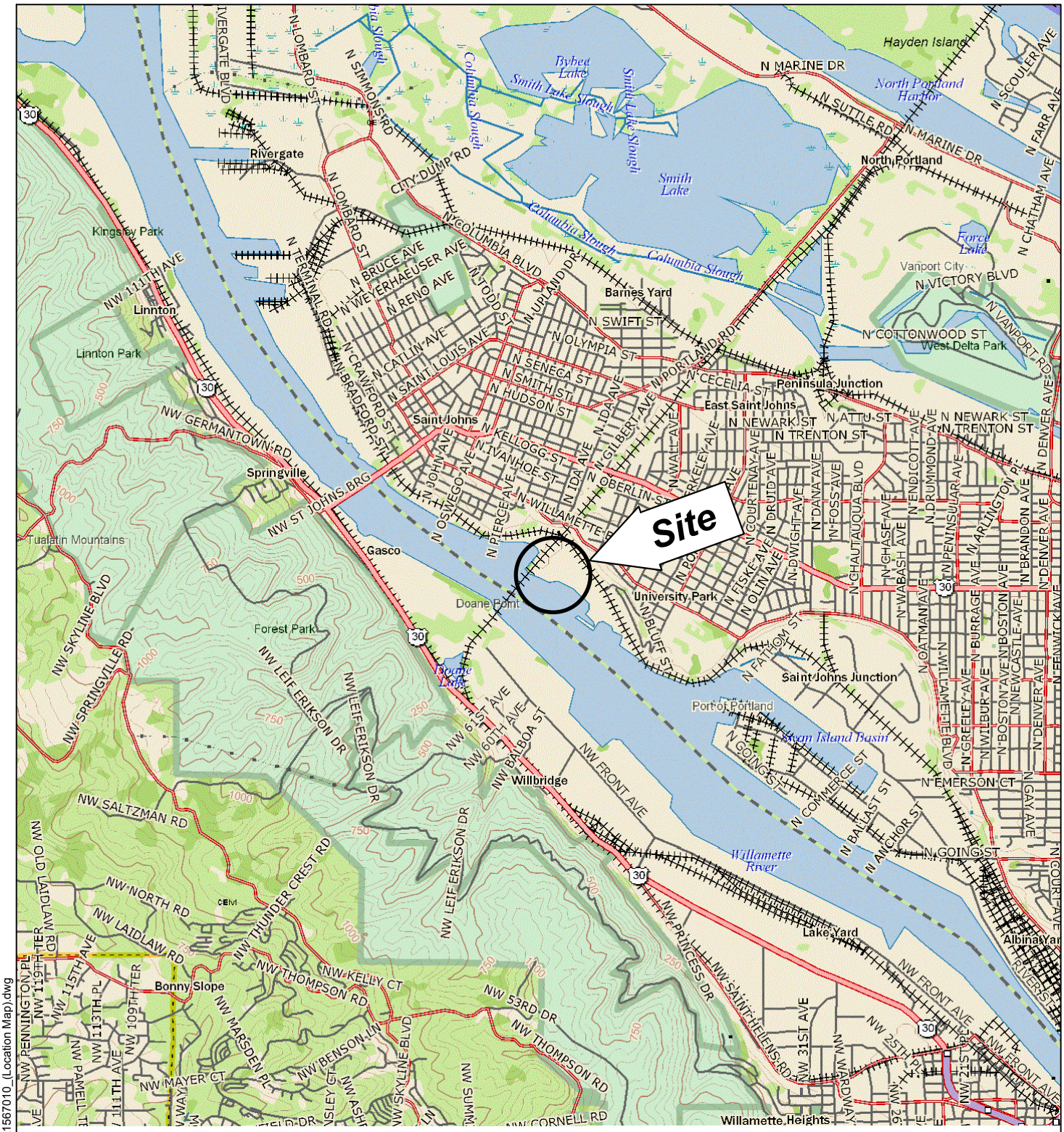
O&M Activity	Frequency
Visual Inspections:	
Cap surface	Quarterly
Subsidence near EW-1s	Quarterly
Stormwater conveyance system	Quarterly
Security fencing	Quarterly
Warning signs	Quarterly
Abundance and survival of vegetation	Quarterly
Routine Maintenance and Monitoring:	
Manual removal of invasive plant	Semiannually, if necessary
Targeted application of herbicides	Semiannually, if necessary
Non-Routine Maintenance:	
Repairs of fence	As needed
Replacement of warning signs	As needed
Repairs of gravel roads	As needed
Filling of potential animal burrow into the earthen cap	As needed
Remove sediments from manholes	As needed
Irrigation	As needed
Replanting unsuccessful trees and shrubs	As needed
Utilities Service:	
Water, electric, alarm, solid waste, toilet	Continuous

Table 7-2: Sediment Cap O&M Activities Planned through 2021
2016 O&M Annual Report
McCormick and Baxter Superfund Site

O&M Activity	Frequency
Visual Inspections (from shore):	
Warning buoys	Quarterly
Cap surface	Quarterly
Habitat quality	Annually
Routine Monitoring:	
Water column and inter-armoring water sampling	Every 5 years (starting in 2015)
Organoclay Core Sampling	In 2015, then determine frequency
Non-Routine Monitoring:	
Multibeam bathymetric surveys, side-scan sonar survey	Every 10 years, starting in 2020; perform as needed (unforeseen natural event)
Diver Inspection	If necessary, will be conducted every 10 years starting in 2020, after bathymetry
Non-Routine Maintenance:	
Replacement of buoys	As needed
Additional armoring placement	Schedule for 2020, if needed. After unforeseen event, if needed
Additional organoclay capping	As needed
ACB grouting or armoring void space maintenance (habitat gravel)	Every 5 years , or as needed based on site inspections

Table 7-3: Groundwater O&M Activities Planned through 2021
2016 O&M Annual Report
McCormick and Baxter Superfund Site

O&M Activity	Frequency
NAPL Monitoring:	
Manual gauging of site wells	Semiannually
Manual extraction from exterior wells	Not recommended
Groundwater Monitoring:	
Downloading continuous water level data from transducers	Semiannually
Manual water level measurements from site wells	Semiannually
Groundwater Sampling:	
Site-wide	2020, Subsequent frequency to be determined
Infiltration pond (MW-59s)	Every 5 years
Routine Maintenance of Equipment:	
Interface probes, pumps, vehicle, data loggers / transducers, etc.	As needed



Source: DeLorme Topo USA.

McCormick and Baxter Superfund Site
6900 N Edgewater Street, Portland, Oregon

Site Location Map

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HARTCROWSER

GSI Water Solutions, Inc.

Figure
1-1

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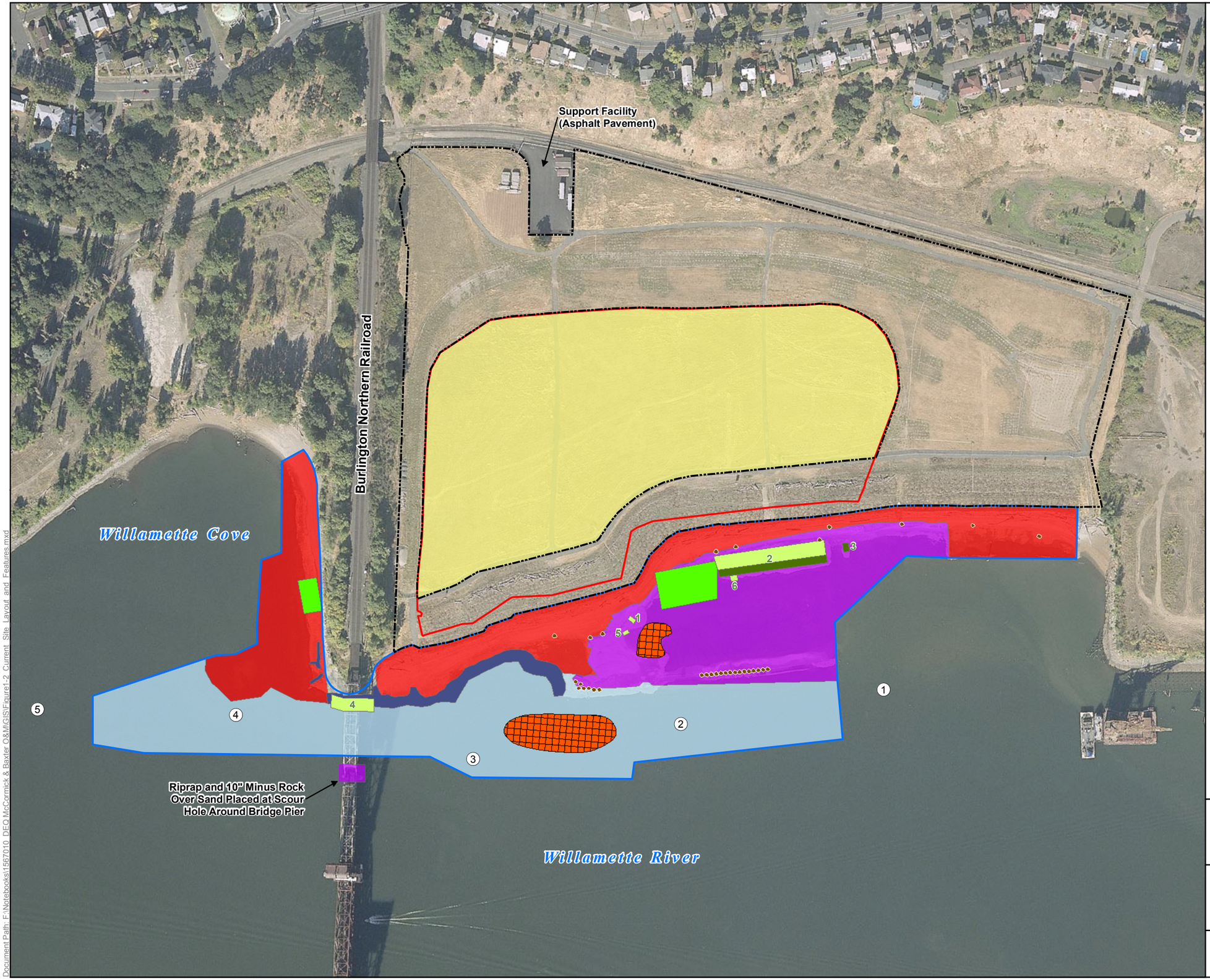

LEGEND

- Subsurface Barrier Wall
- Sediment Cap Boundary
- Granular Organophilic Clay
- Organoclay™ Reactive Core Mats (Double)
- Organoclay™ Reactive Core Mats (Single)
- Thickened Sand Layer
- Boulder Clusters
- Buoy Locations
- Riprap Armor
- Articulated Concrete Block
- 6" Minus Rock Armor
- 10" Minus Rock Armor
- Impermeable Cap Earthen
- Soil Cap Boundary

NOTE:
Aerial photo taken on September 22, 2006.

0 250 500
Scale in feet

McCormick and Baxter Superfund
Site Portland, Oregon

Current Site Layout and Features

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HARTCROWSER GSI Water Solutions, Inc.

Figure
1-2

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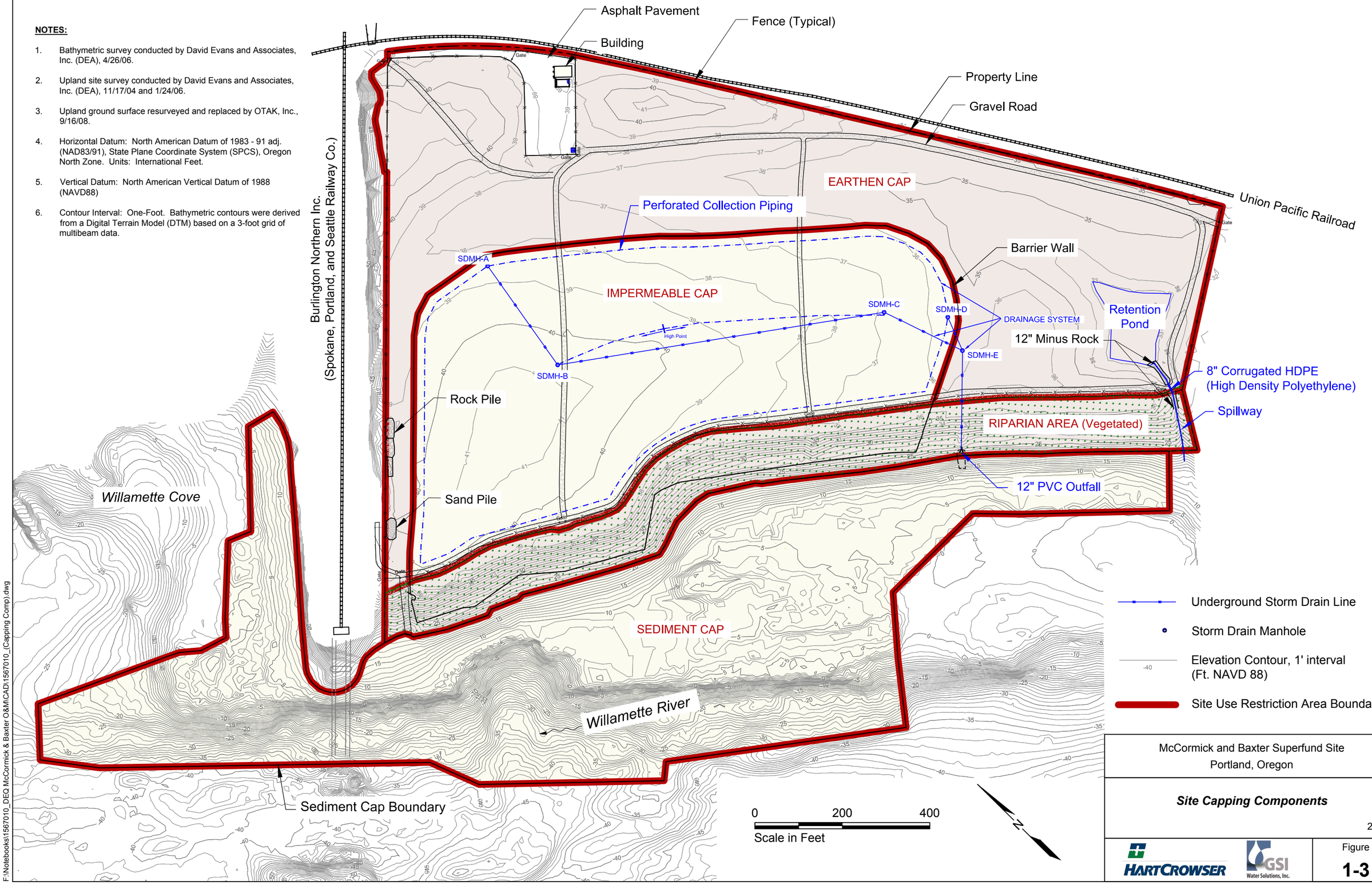
NOTES:

1. Bathymetric survey conducted by David Evans and Associates, Inc. (DEA), 4/26/06.
2. Upland site survey conducted by David Evans and Associates, Inc. (DEA), 11/17/04 and 1/24/06.
3. Upland ground surface resurveyed and replaced by OTAK, Inc., 9/16/08.
4. Horizontal Datum: North American Datum of 1983 - 91 adj. (NAD83/91), State Plane Coordinate System (SPCS), Oregon North Zone. Units: International Feet.
5. Vertical Datum: North American Vertical Datum of 1988 (NAVD88)
6. Contour Interval: One-Foot. Bathymetric contours were derived from a Digital Terrain Model (DTM) based on a 3-foot grid of multibeam data.



McCormick and Baxter Superfund Site
Portland, Oregon

Site Capping Components

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HARTCROWSER | GSI Water Solutions, Inc.

Figure
1-3

F:\Notebooks\1567010_DEQ McCormick & Baxter O&M\CAD\1567010_(Capping Comp).dwg

NOTES:

1. Bathymetric survey conducted by David Evans and Associates, Inc. (DEA), 4/26/06.
2. Upland site survey conducted by David Evans and Associates, Inc. (DEA), 11/17/04 and 1/24/06.
3. Upland ground surface resurveyed and replaced by OTAK, Inc., 9/16/08.
4. Horizontal Datum: North American Datum of 1983 - 91 adj. (NAD83/91), State Plane Coordinate System (SPCS), Oregon North Zone. Units: International Feet.
5. Vertical Datum: North American Vertical Datum of 1988 (NAVD88)
6. Contour Interval: One-Foot. Bathymetric contours were derived from a Digital Terrain Model (DTM) based on a 3-foot grid of multibeam data.
7. Additional rock was placed at the 6" minus rock placement areas on 6/26/07. These areas have not been surveyed and the contours of this figure do not reflect the additional rock placement.

Burlington Northern Inc.
(Spokane, Portland, and Seattle Railway Co.)

Building
A2'
Asphalt Pavement
Property Line
Fence (Typ.)
Union Pacific Railroad
Gravel Road
Perforated Collection Piping
EARTHEN CAP
Subsuface Barrier Wall
SDMH-A
SDMH-C
SDMH-D
DRAINAGE SYSTEM
Retention Pond
High Point
SDMH-E
12" Minus Rock
SDMH-B
IMPERMEABLE CAP
8" Corrugated HDPE (High Density Polyethylene)
Rock Pile
Spillway
12" PVC Outfall
Sand Pile
Willamette Cove
SEDIMENT CAP
A2
A2
Sediment Cap Boundary
Willamette River
DSL Easement (#31530-EA)

0 200 400
Scale in Feet

-40- Elevation Contour, 1' Interval (Ft. NAVD 88)
Boulder Clusters/Rock Mound
Riprap Armor
Organoclay Mat (Double Layer)
Organoclay Mat (Single Layer)
Granular Organoclay
Hot Spot Treatment (Thickened Sand Layer)
Articulated Concrete Block
6-Inch Minus Rock Armor
10-Inch Minus Rock Armor
Turf Reinforcement Mat Placed Over Earthen Cap
A2 A2' Cross Section Line (for Figure 1-6)

McCormick and Baxter Superfund Site
Portland, Oregon

Current Site Layout with Surface Elevations

2/17

HARTCROWSER GSI Water Solutions, Inc.

Figure
1-4

F:\Notebooks\1567010_DEQ McCormick & Baxter O&M\CAD\1567010_(Current Site Layout-surfelev).dwg

Residential Area

Site Entrance

Bunker Oil Area

Parking Lot

North Edgewater Street

Union Pacific Railroad

Treated Log Storage

Treated Log Storage

Office

Paint Shed

Gravel Driveway

Central Process Area

Water Treatment Plant

Lab

Retort 2 Pit

Retort 1 Pit

Former Tank Farm

Butt Tank 1

Southeast Disposal Trench Area

Stacker Shed

Retort 3 Pit

Butt Tank 1

Cellon Wash Area

Tank Farm Area (TFA)

Treated Log Storage

Framing Shed

Burlington Northern Railroad

Retort 4 Pit

PCP Mixing Shed

Former Creosote Tank 4

Former Disposal Location

Rail Spurs

OUTFALL 001 (Former Cooling Water)

OUTFALL 003 (Stormwater)

OUTFALL 004 (Stormwater)

Former Waste Disposal Area (FWDA)

WILLAMETTE RIVER

OUTFALL 002 (Stormwater Treated Water)

Sandy Beach

Creosote Dock

Fence

Former Feature

0 200 400

Scale in Feet

N

McCormick and Baxter Superfund Site
Portland, Oregon

Historical Contaminant Source Areas

2/17

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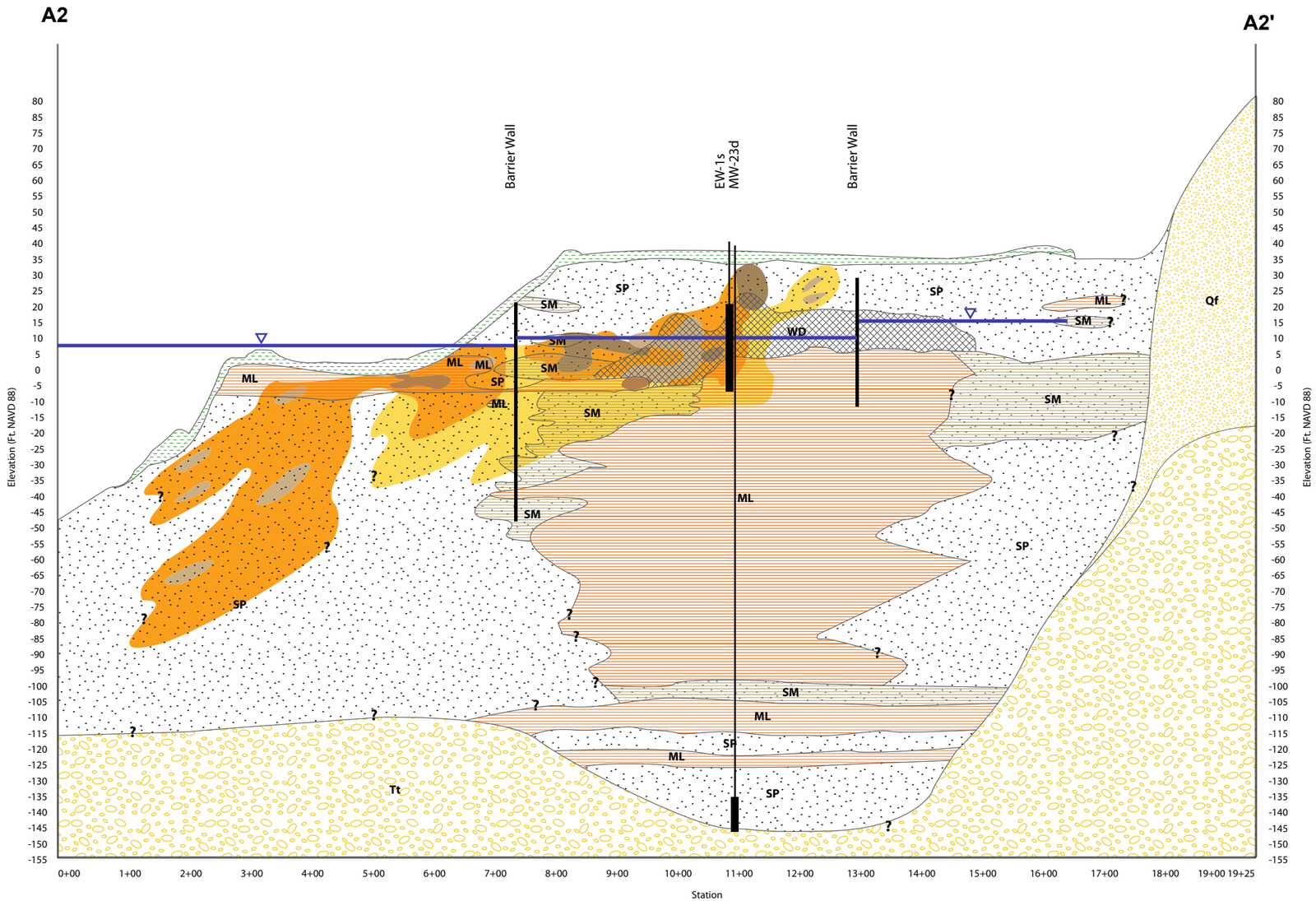
GSI Water Solutions, Inc.

Figure
1-5

F:\Notebooks\1567010_DEQ McCormick & Baxter O&M\CAD\1567010_(Historic Contamination).dwg



LEGEND

- SP- Sand, Fine to Medium, Poorly Graded
- SM- Silt Sand, or Thin Interbeds of Silt and Sand
- ML- Clayey Silt or Silty Clay
- WD- Wood Debris, Chips or Sawdust Occasionally
- Qf- Catastrophic Flood Deposits Consisteing of Gravels and Sands
- Tt-Troutdale Formation
- Sediment/Soil Cap
- Approximate Average Water Level 2008
- Creosote Odor
- Strong Creosote Odor
- Heavy Sheen
- Saturated

NOTE: Refer to Figure 1-4 for Plan View of Cross Section Location.

Horizontal Scale in Feet
0 200 400
0 40 80
Vertical Scale in Feet
Vertical Exaggeration = 5x

McCormick and Baxter Superfund Site
Portland, Oregon

Historical NAPL Distribution Cross Section

2/17

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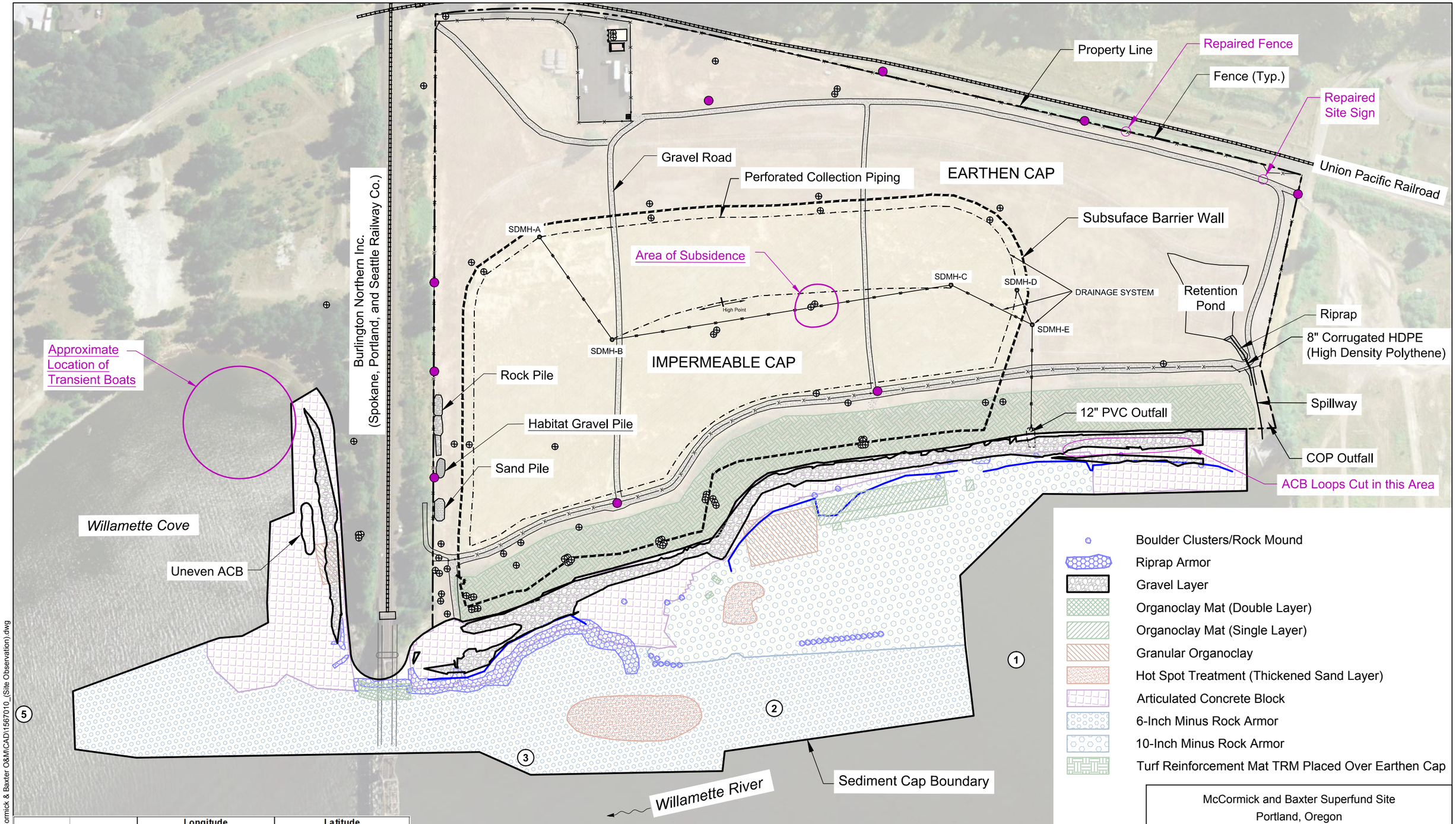
Figure
1-6

F:\Notebooks\1567010_DEQ McCormick & Baxter O&M\CAD\1567010_(NAPL X-Sect).pdf



		Longitude			Latitude		
Location ID Figure 2.5	Buoy Label	Degree	Minute	Second	Degree	Minute	Second
1	Danger Rocks	-122	44	27.9115188	45	34	33.7505887
2	Danger Rocks	-122	44	34.6730244	45	34	36.3603940
3	Danger Rocks	-122	44	41.5979124	45	34	39.0343156
4	Danger Rocks	-122	44	47.5345212	45	34	43.8265931
5	Danger Rocks	-122	44	53.2295880	45	34	47.1865397
Coordinate projection: GCS_North_American_1983							

(1) Buoy
Monitoring Well
Animal Burrow

0 200 400
Scale in Feet

N

McCormick and Baxter Superfund Site
Portland, Oregon

Site Observation Summary

2/17

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Figure
2-1

F:\Notebooks\1567010_DEQ McCormick & Baxter O&M\CAD\1567010_(Site Observation).dwg

LEGEND

- Groundwater Monitoring Wells
- Groundwater Monitoring Wells with Transducers
- Subsurface Barrier Wall

NOTE:
Aerial photo taken on September 22, 2006.

0 200 400
Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

Groundwater Monitoring Well Location Map

12/15

HARTCROWSER GSI Water Solutions, Inc.

Figure
4-1

Document Path: P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project GIS\Project mxds\2015 Annual Report\Figure4-1 Monitoring Well Location Map.mxd

LEGEND

- Groundwater Monitoring Wells (Groundwater Elevation)
- Groundwater Monitoring Wells with Transducers (Groundwater Elevation)
- Groundwater Elevation Contours (dashed where inferred)
- Willamette River Level During Sampling Event (8.8 feet)
- Subsurface Barrier Wall

NOTES:

1) Elevations shown in NAVD 88.
2) Aerial photo taken on September 22, 2006.
3) Water levels measured between 8:55 and 13:00.
4) Willamette River low tide at 8:30 at 8.8 feet NAVD88.
5) Unable to access MW-7 WC.
6) Unable to access MW-52s and MW-53s during June monitoring event. Remeasured on July 21, 2016.

0 200 400

Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

Groundwater Contour Map for June 27, 2016 Sampling Event

1/17

HARTCROWSER GSI Water Solutions, Inc.

Figure
4-2

Document Path: P:\Portland\205 - OR DEQ\003-003 M&B\Project_GIS\Project_mxds\2016_Annual_Report\Figure4-2_GW_Elevations_June2016.mxd

LEGEND

- Groundwater Monitoring Wells (Groundwater Elevation)
- Groundwater Monitoring Wells with Transducers (Groundwater Elevation)
- Groundwater Elevation Contours (dashed where inferred)
- Willamette River Level During Sampling Event (6.2 feet)
- Subsurface Barrier Wall

NOTES:

1) Elevations shown in NAVD 88.
2) Aerial photo taken on September 22, 2006.
3) Water levels measured between 8:45 and 13:05.
4) Willamette River low tide at 11:00 at 6.2 feet NAVD88.
5) Unable to access MW-7 WC.
6) EW-2s was measured on October 18, 2016, not included in contouring.

0 200 400

Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

Groundwater Contour Map for October 11, 2016 Sampling Event

1/17

HARTCROWSER GSI Water Solutions, Inc.

Figure **4-3**

Document Path: P:\Portland\205 - OR DEQ\003-003 M&B\Project_GIS\Project_mxds\2016_Annual_Report\Figure4-3_GW_Elevations_Oct2016.mxd

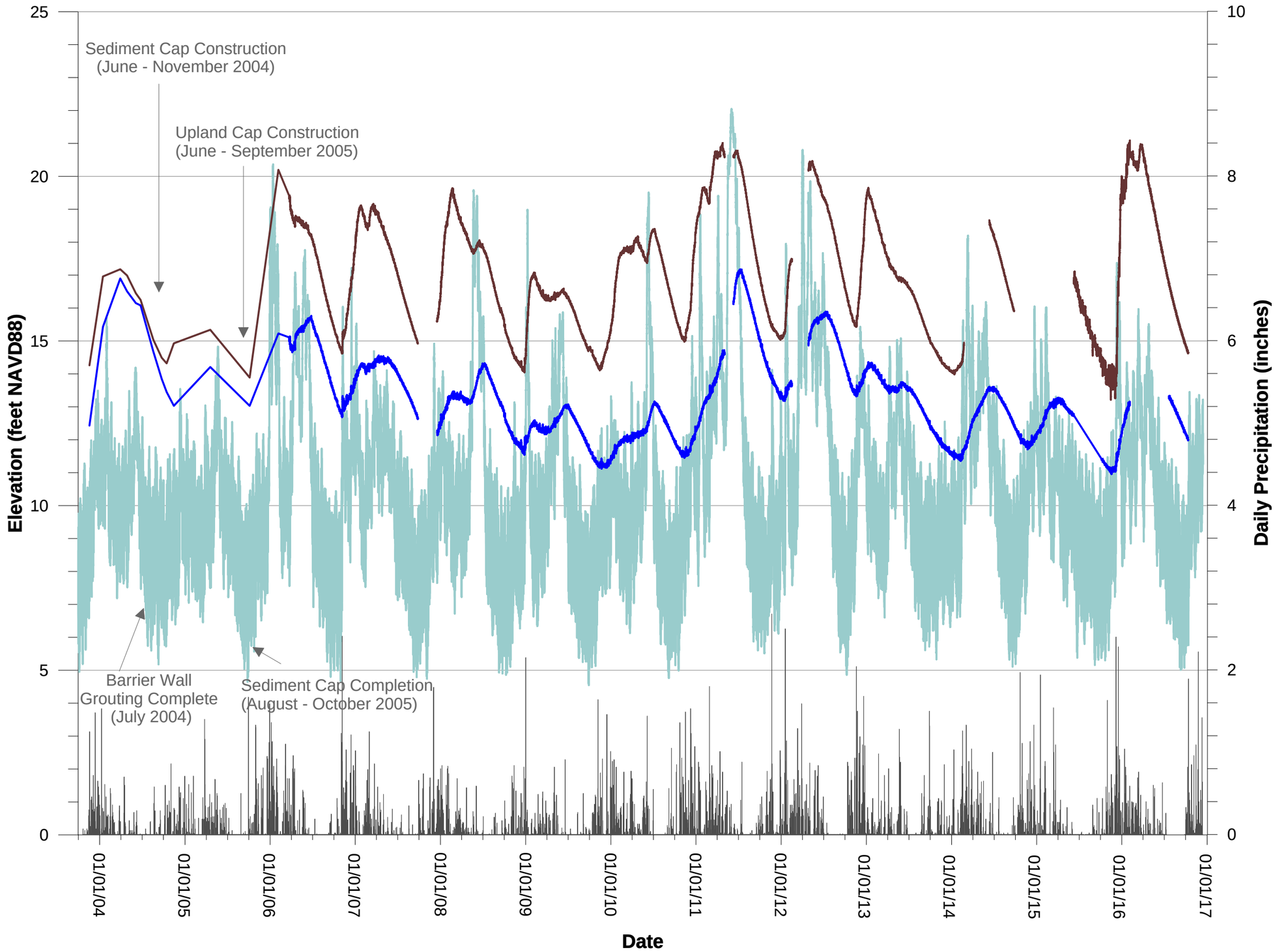

Figure 4-4:
Post-Barrier Wall Groundwater Elevations
Monitoring Wells MW-52s and MW-53s

McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- MW-52s (Interior)
- MW-53s (Exterior)
- River
- Precipitation

Notes:
MW-52s is located inside the barrier wall and MW-53s is located outside the barrier wall.

Top of Barrier wall (not shown) is about 31 ft NAVD.

Prior to March 23, 2006 water level measurements are manual and intermittent.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

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GSI Water Solutions, Inc.

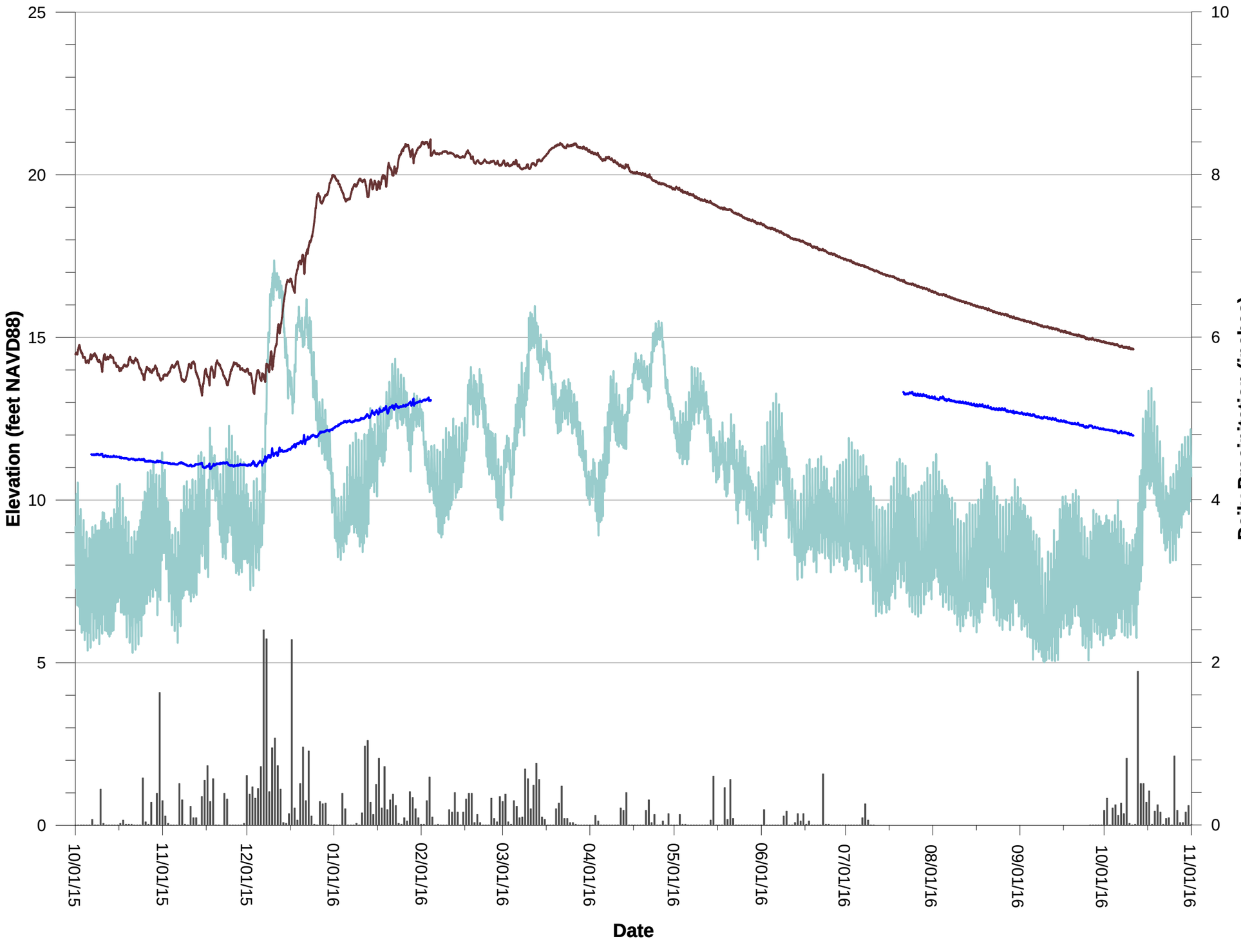

Figure 4-5:
2016 Groundwater Elevations
Monitoring Wells MW-52s and MW-53s

McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- MW-52s (Interior)
- MW-53s (Exterior)
- River
- Precipitation

Notes:
MW-52s is located inside the barrier wall and MW-53s is located outside the barrier wall.

Top of Barrier wall (not shown) is about 31 ft NAVD.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

HARTCROWSER

GSI Water Solutions, Inc.

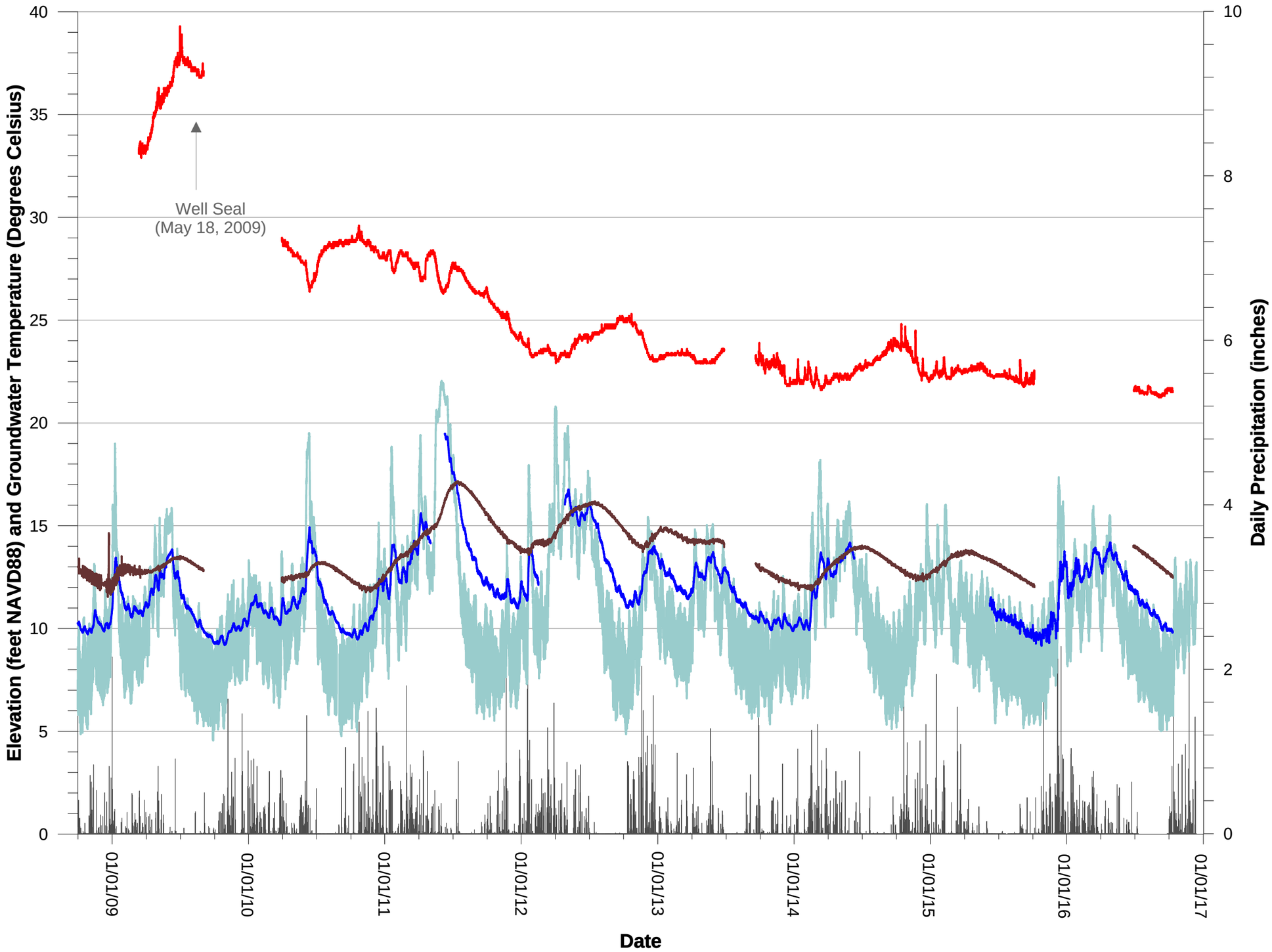

Figure 4-6:
2008 to 2016 Groundwater Temperature in Montoring Well EW-1s and Groundwater Elevations Monitoring Wells MW-36s and EW-1s

McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- EW-1s Temperature
- EW-1s Water Elevation
- MW-36s Water Elevation
- River Elevation
- Precipitation

Notes:
Monitoring wells EW-1s and MW-36s are located inside the barrier wall.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

Groundwater elevation manually adjusted 0.25 ft up between 17:00 on May 6, 2010 and 14:00 on June 15, 2010 due to apparent displacement from field activities.

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HARTCROWSER

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Figure 4-7:
2016 Groundwater Temperature in Montoring Well EW-1s and Groundwater Elevations Monitoring Wells MW-36s and EW-1s

McCormick and Baxter Superfund Site Portland, OR

LEGEND

- EW-1s Temperature
- EW-1s (Interior)
- MW-36s (Interior)
- River
- Precipitation

Notes:
Monitoring wells EW-1s and MW-36s are located inside the barrier wall.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

File Path: \\PDX\Projects\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project_GIS\Project_mxds\Misc_Maps\Base_Grapher.mxd

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Current Top of Wall Elevation at 22.15 ft NAVD88

Sediment Cap Construction (June - November 2004)

Upland Cap Construction (June - September 2005)

Barrier Wall Grouting Complete (July 2004)

Sediment Cap Completion (August - October 2005)

Elevation (feet NAVD88)

Daily Precipitation (inches)

Date

Figure 4-8:
Post-Barrier Wall Groundwater Elevations in Monitoring Wells MW-36 and MW-37

McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- MW-36s (Interior)
- MW-36i (Interior)
- MW-36d (Interior)
- MW-37s (Exterior)
- MW-37i (Exterior)
- MW-37d (Exterior)
- River
- Precipitation

Notes:
MW-36 wells are located inside the barrier wall and MW-37 wells are located outside the barrier wall.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer that was not collecting accurate pressure readings. Transducers in MW-36i and MW-37i were removed on February 16, 2012.

HARTCROWSER

GSI Water Solutions, Inc.

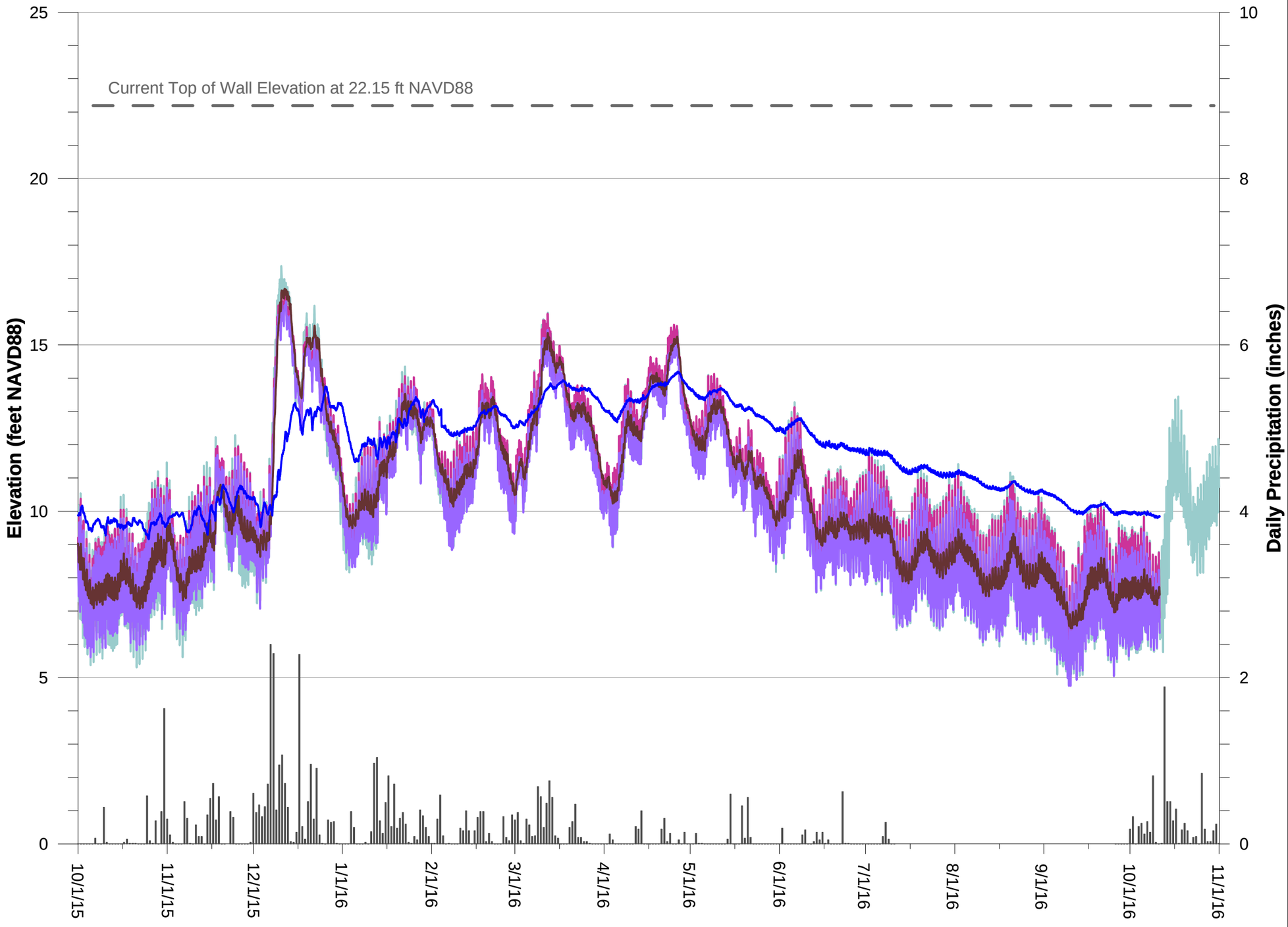

Figure 4-9:
2016 Groundwater Elevations in Monitoring Wells MW-36 and MW-37

McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- MW-36s (Interior)
- MW-36d (Interior)
- MW-37s (Exterior)
- MW-37d (Exterior)
- River
- Precipitation

Notes:
MW-36 wells are located inside the barrier wall and MW-37 wells are located outside the barrier wall.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

HARTCROWSER

GSI Water Solutions, Inc.

Current Top of Wall Elevation at 23.35 ft NAVD88

Sediment Cap Construction (June - November 2004)

Upland Cap Construction (June - Sept 2005)

Barrier Wall Grouting Complete (July 2004)

Sediment Cap Completion (August - October 2005)

Elevation (feet NAVD88)

Daily Precipitation (inches)

Date

Figure 4-10:
Post-Barrier Wall Groundwater Elevations in Monitoring Wells MW-44 and MW-45

McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- MW-44s (Interior)
- MW-44i (Interior)
- MW-44d (Interior)
- MW-45s (Exterior)
- MW-45i (Exterior)
- MW-45d (Exterior)
- River
- Precipitation

Notes:
MW-44 well cluster is located inside the barrier wall and MW-45 well cluster is located outside the barrier wall.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings. Transducers were removed from MW-44i and MW-45i on February 16, 2012.

HARTCROWSER

GSI Water Solutions, Inc.

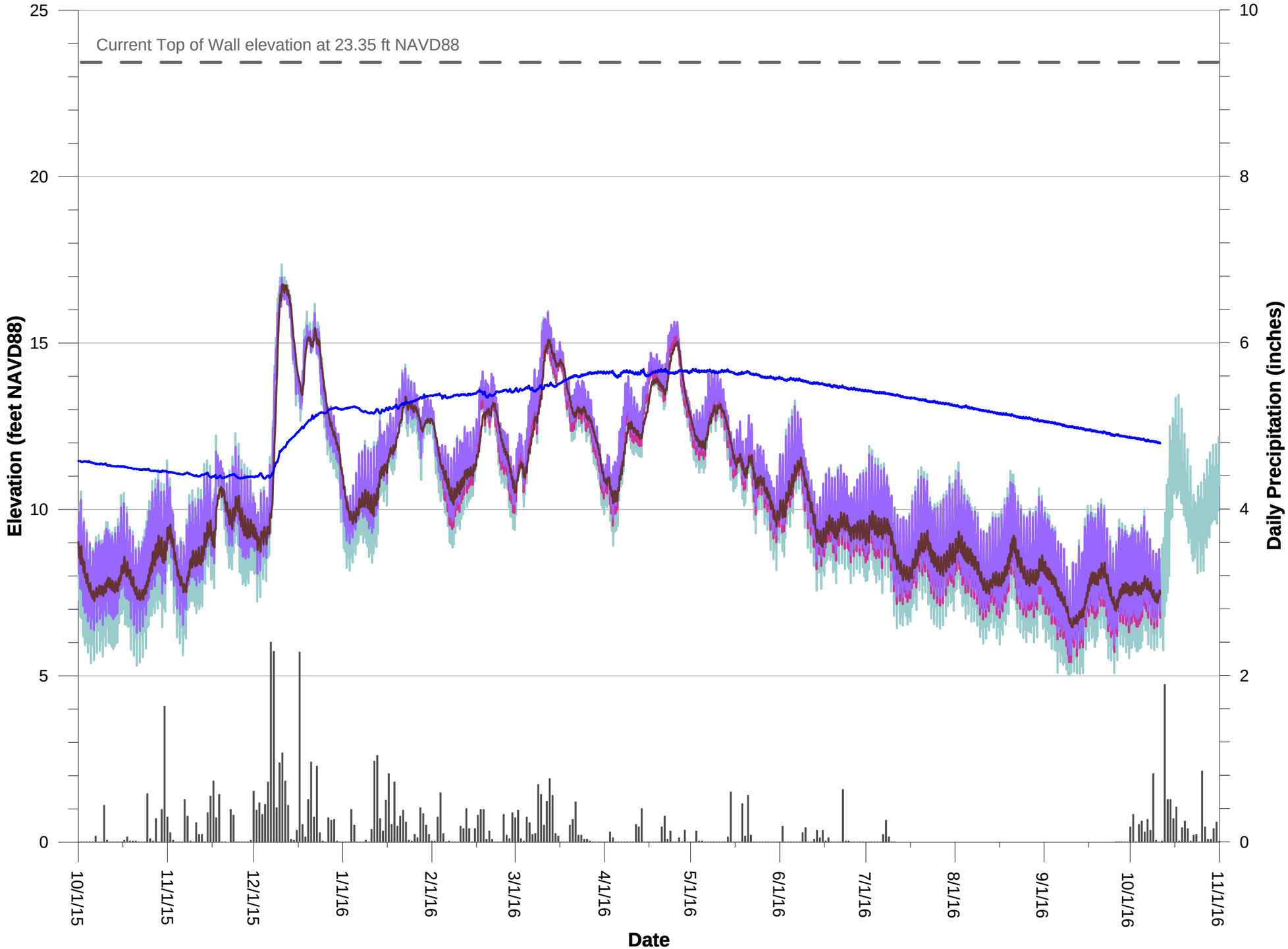

Figure 4-11:
2016 Groundwater Elevations in Monitoring Wells MW-44 and MW-45

McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- MW-44s (Interior)
- MW-44d (Interior)
- MW-45s (Exterior)
- MW-45d (Exterior)
- River
- Precipitation

Notes:
MW-44 well cluster is located inside the barrier wall and MW-45 well cluster is located outside the barrier wall.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

HARTCROWSER

GSI Water Solutions, Inc.

LEGEND

Groundwater Monitoring Wells (Thickness of LNAPL or DNAPL)

- Wells with LNAPL
- Wells with DNAPL
- Wells without LNAPL or DNAPL
- Subsurface Barrier Wall

NOTE:
Aerial photo taken on September 22, 2006.

0 200 400
Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

LNAPL and DNAPL Distribution Map for June 27, 2016 Sampling Event

1/17

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Figure
4-12

Document Path: P:\Portland\205 - OR DEQ\003-003 M&B\Project GIS\Project mxds\2016 Annual Report\Figure4-12 LNAPL and DNAPL Map June9 2015.mxd

LEGEND

Groundwater Monitoring Wells (Thickness of LNAPL or DNAPL)

- Wells with LNAPL
- Wells with DNAPL
- Wells without LNAPL or DNAPL
- Subsurface Barrier Wall

NOTES:

1) Aerial photo taken on September 22, 2006.
2) EW-2s was measured on October 18, 2016.

0 200 400

Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

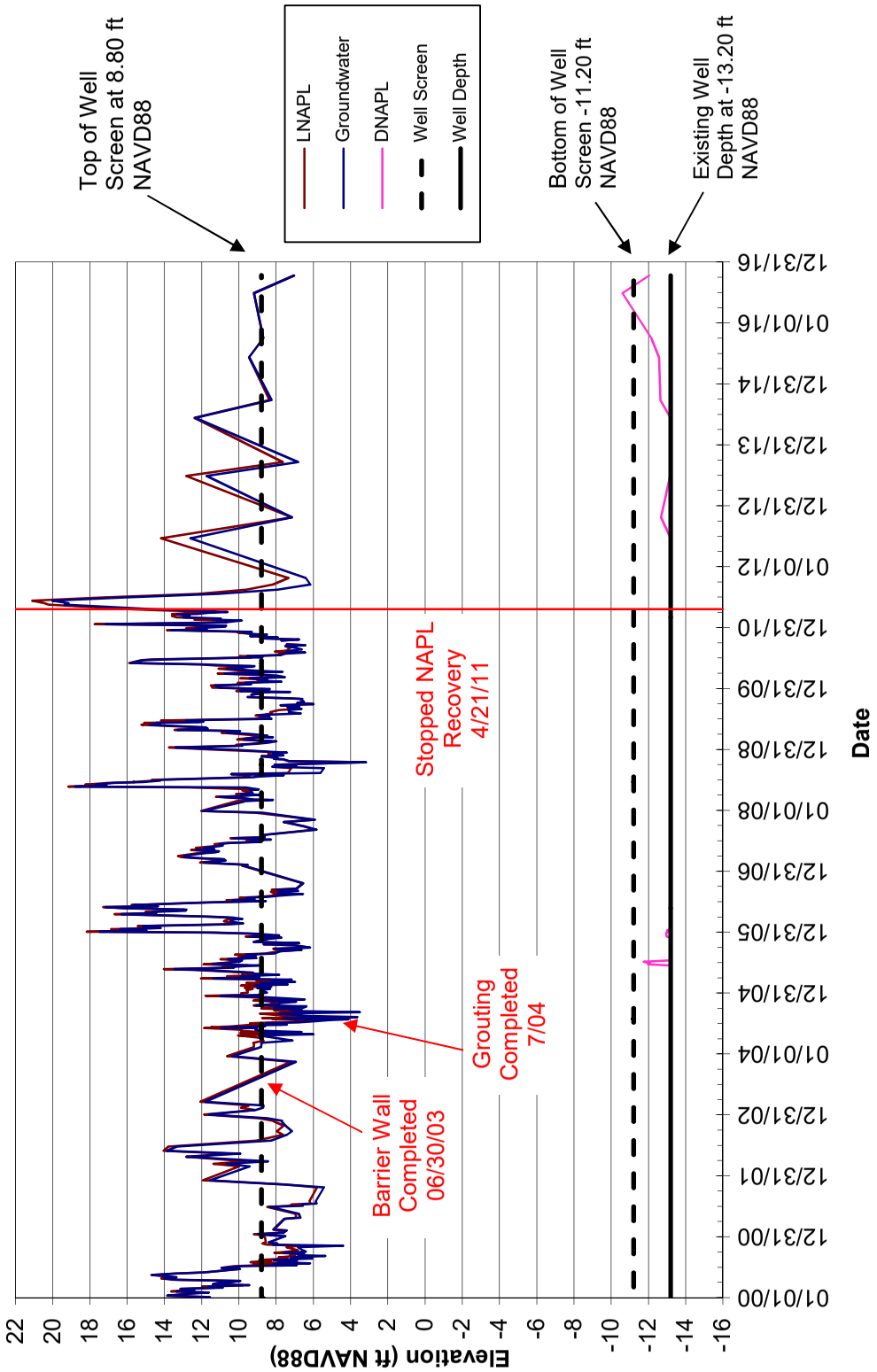
LNAPL and DNAPL Distribution Map for October 11, 2016 Sampling Event

1/17

HARTCROWSER GSI Water Solutions, Inc.

Figure
4-13

Document Path: P:\Portland\205 - OR DEQ\003-003 M&B\Project GIS\Project mxds\2016 Annual Report\Figure4-13 LNAPL and DNAPL Map Oct2016.mxd



McCormick and Baxter Superfund Site
Portland, Oregon

1999 to 2016 NAPL Thickness Plot for Well EW-10s

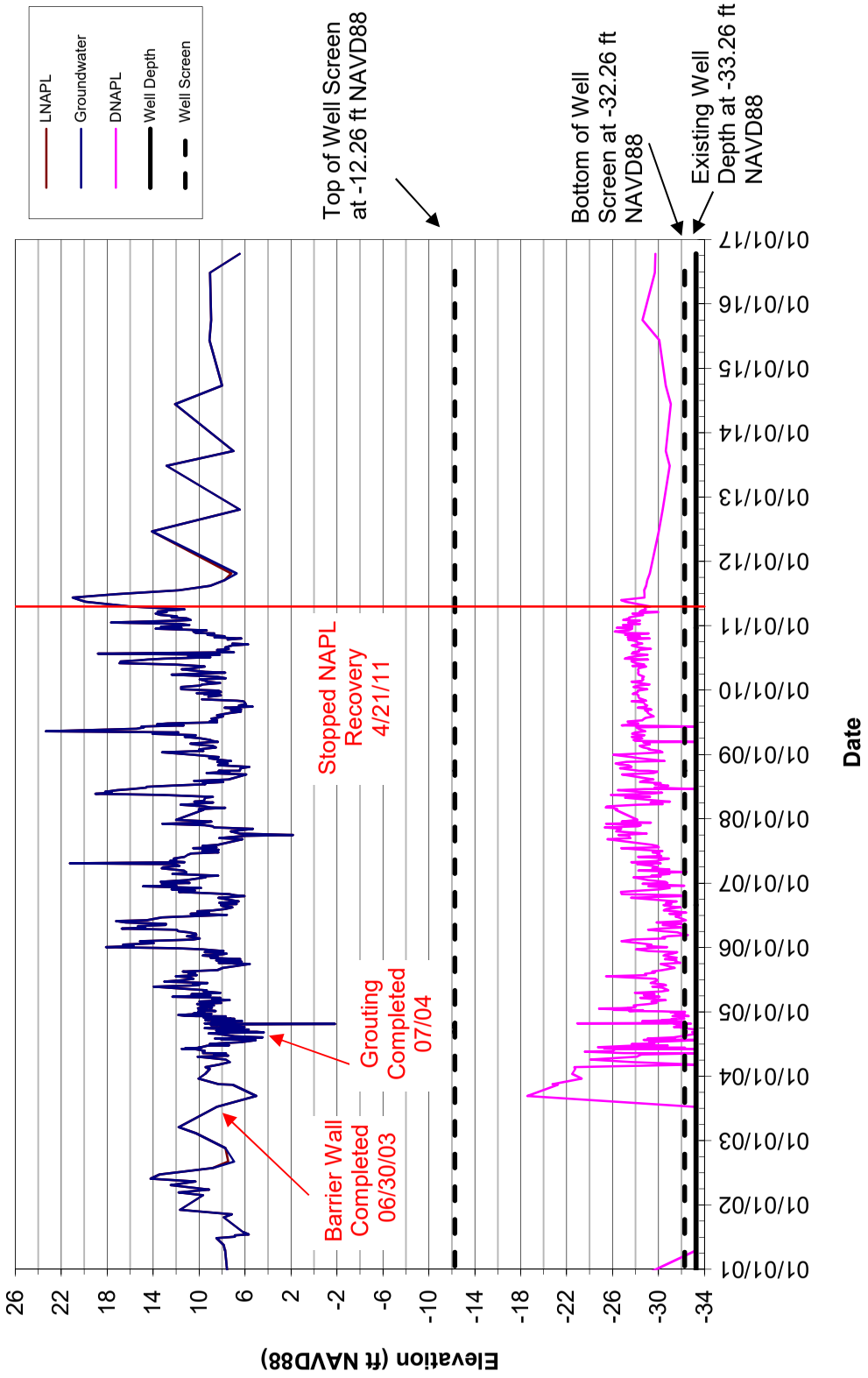
12/2016

HARTCROWSER

GSI Water Solutions, Inc.

Figure

4-14



Note: DNAPL recovery was attempted in July 2007 but the extracted liquid appeared to be water with speck sized globules of DNAPL (with a creosote odor), rather than a distinct layer, suggesting that the DNAPL thicknesses measured may not accurately reflect the amount of DNAPL in the well.

McCormick and Baxter Superfund Site
Portland, Oregon

2001 to 2016 NAPL Thickness Plot for Well MW-20i

12/2016

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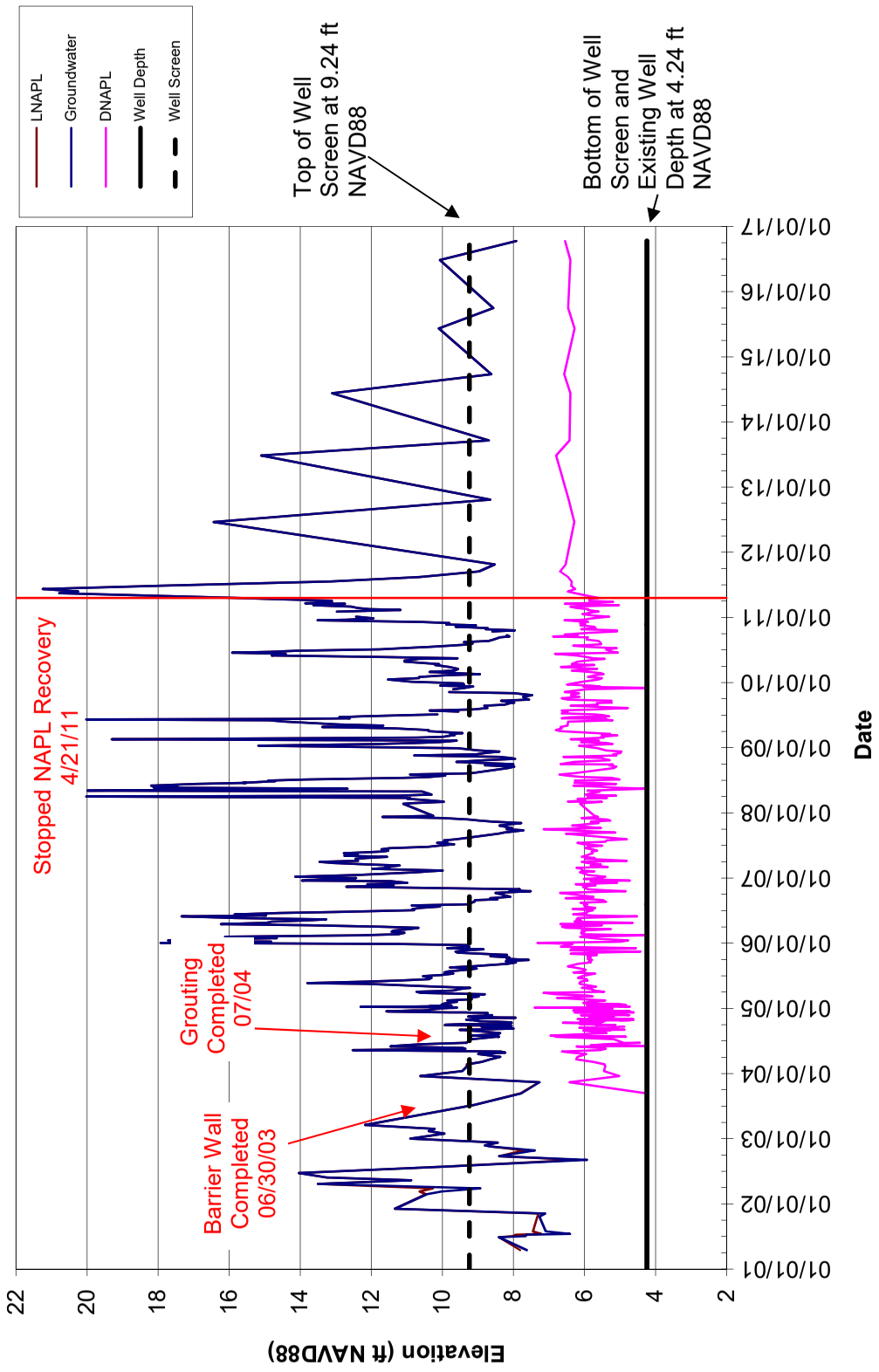
Figure

4-15



McCormick and Baxter Superfund Site
Portland, Oregon

2001 to 2016 NAPL Thickness Plot for Well MW-Ds

12/2016

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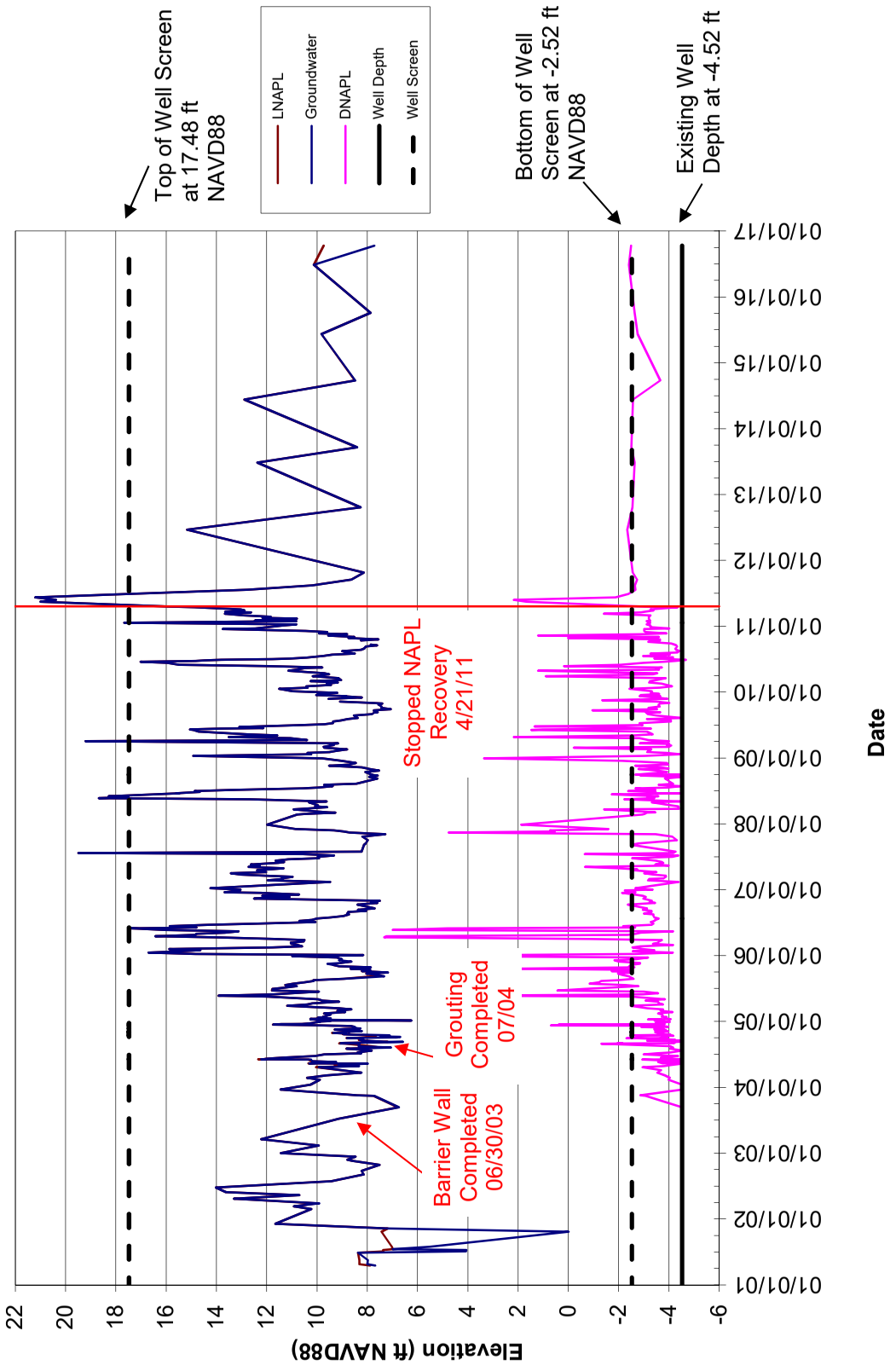
Figure

4-16



McCormick and Baxter Superfund Site
Portland, Oregon

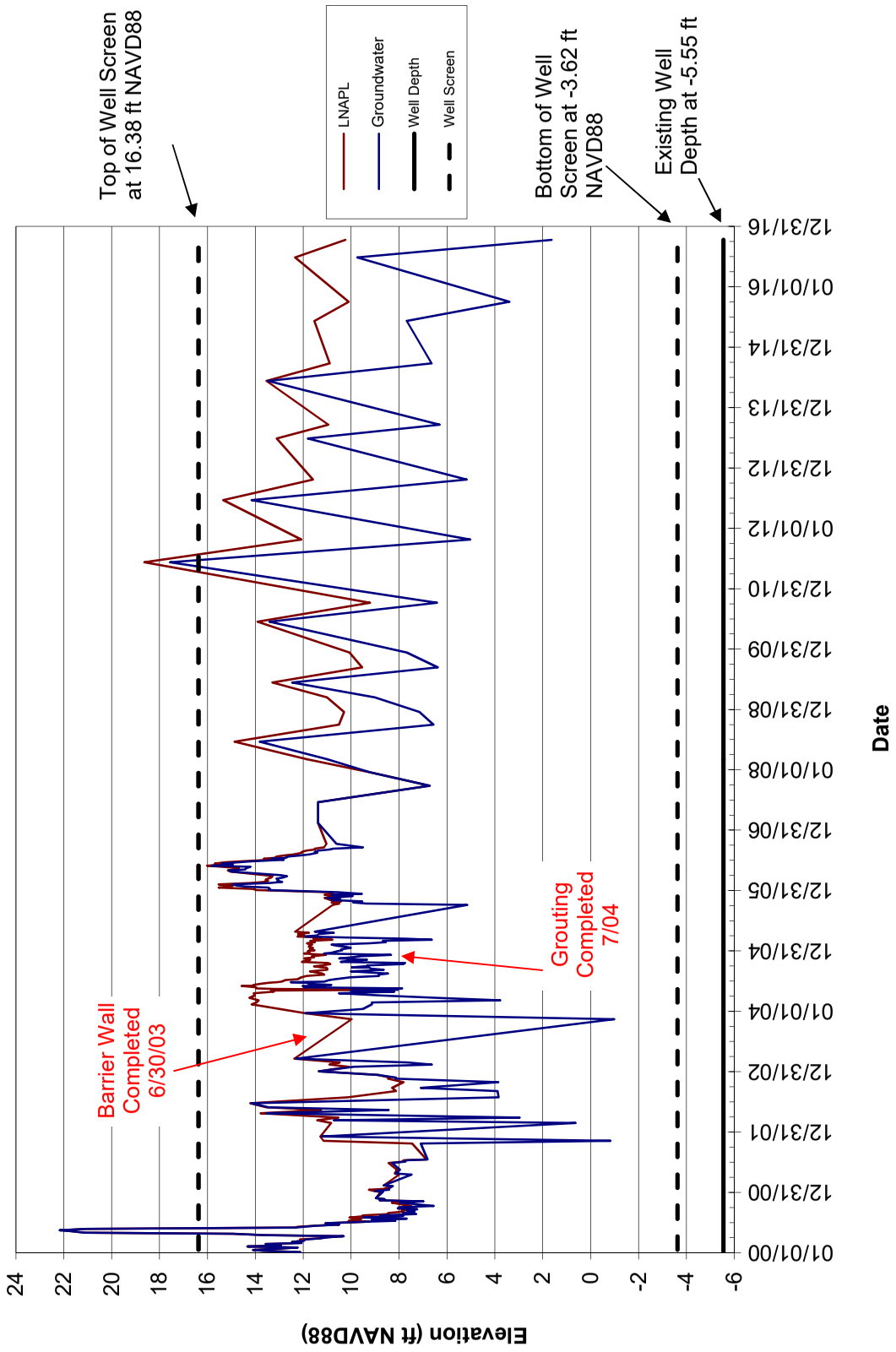
2001 to 2016 NAPL Thickness Plot for Well MW-Gs

12/2016

HARTCROWSER GSI Water Solutions, Inc.

Figure

4-17



McCormick and Baxter Superfund Site
Portland, Oregon

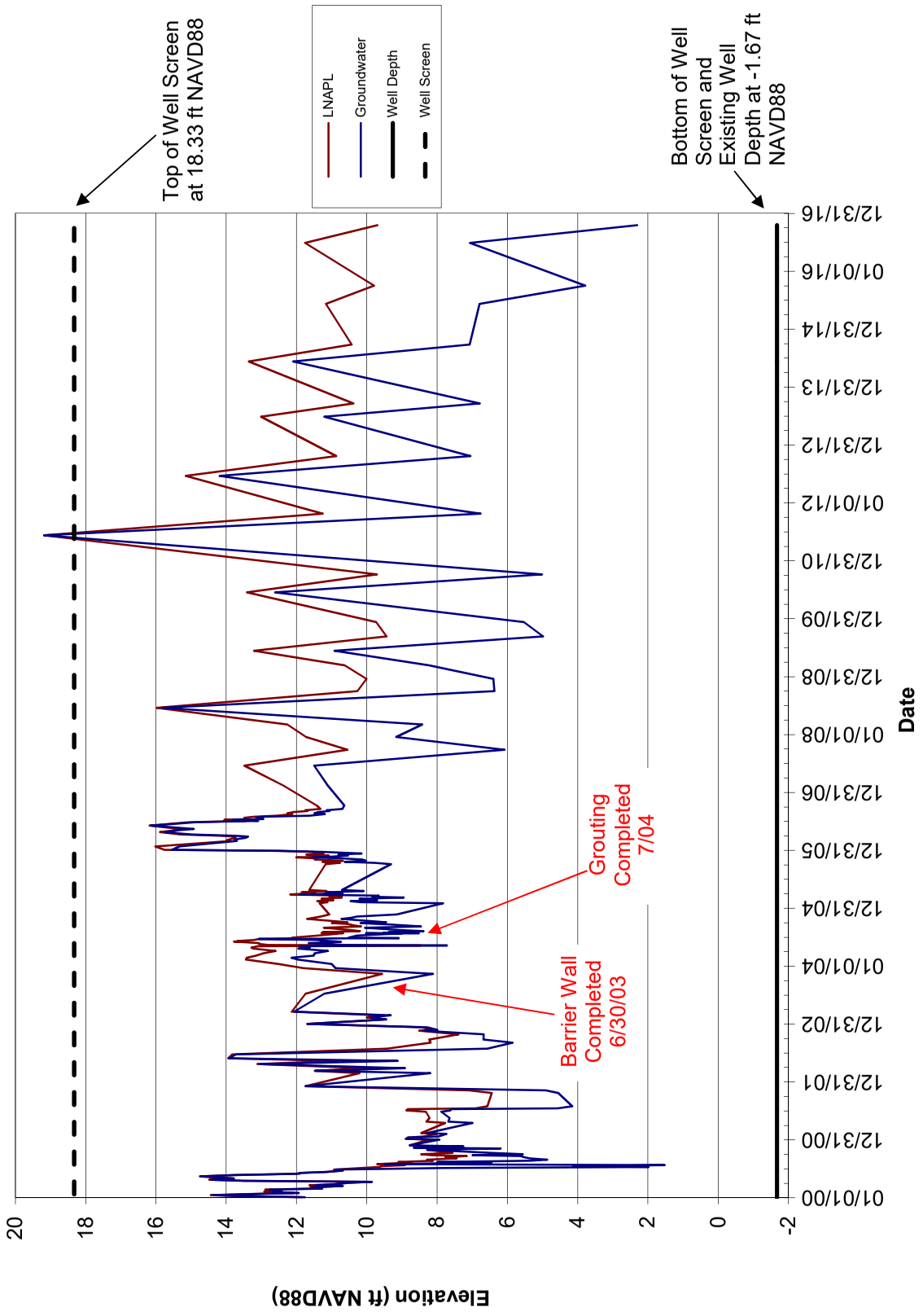
1999 to 2016 NAPL Thickness Plot for Well EW-15s

12/2016

HARTCROWSER GSI Water Solutions, Inc.

Figure

4-18



McCormick and Baxter Superfund Site
Portland, Oregon

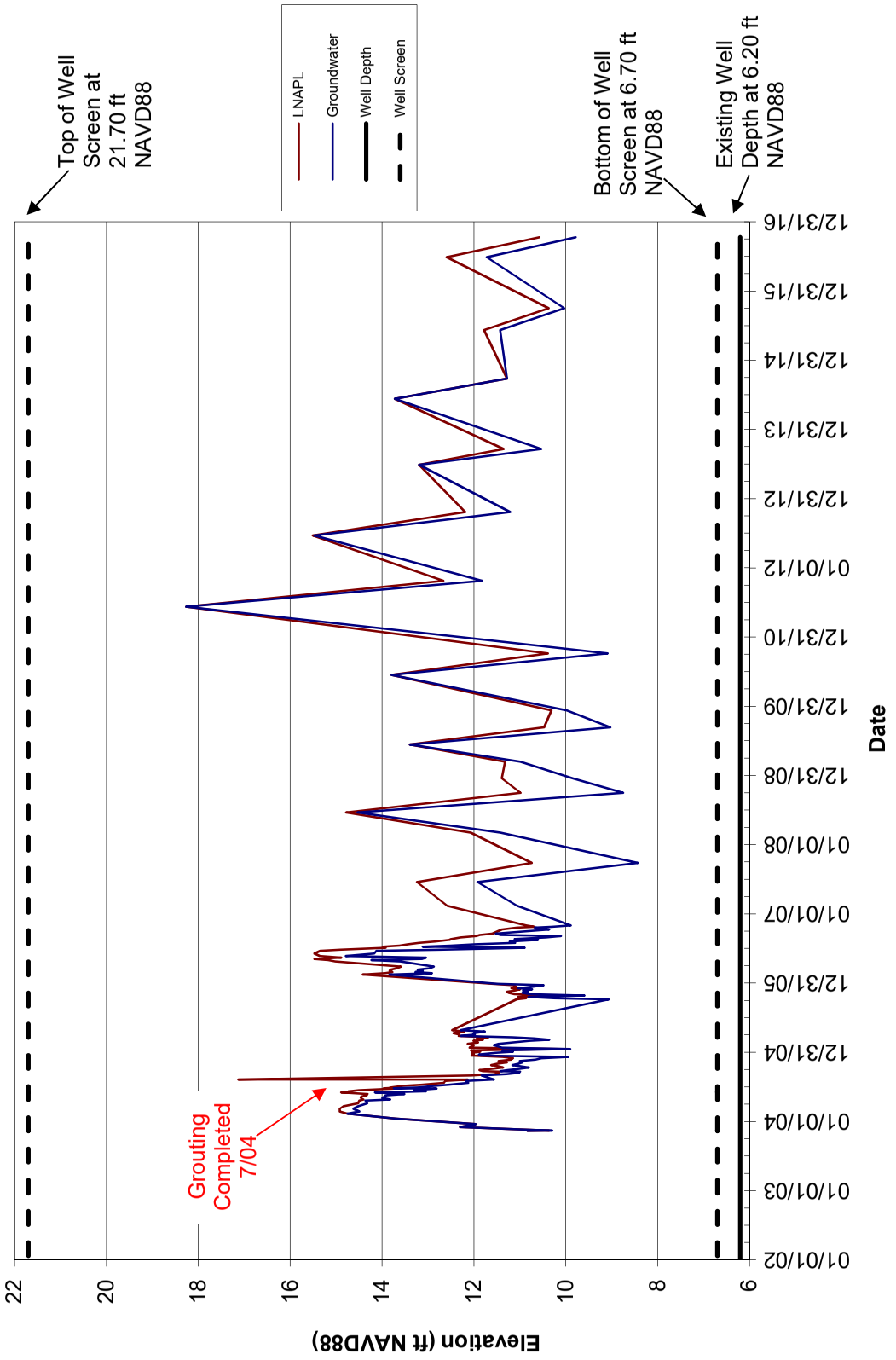
1999 to 2016 NAPL Thickness Plot for Well EW-23s

12/2016

HARTCROWSER GSI Water Solutions, Inc.

Figure

4-19



McCormick and Baxter Superfund Site
Portland, Oregon

2003 to 2016 NAPL Thickness Plot for Well MW-56s

12/2016

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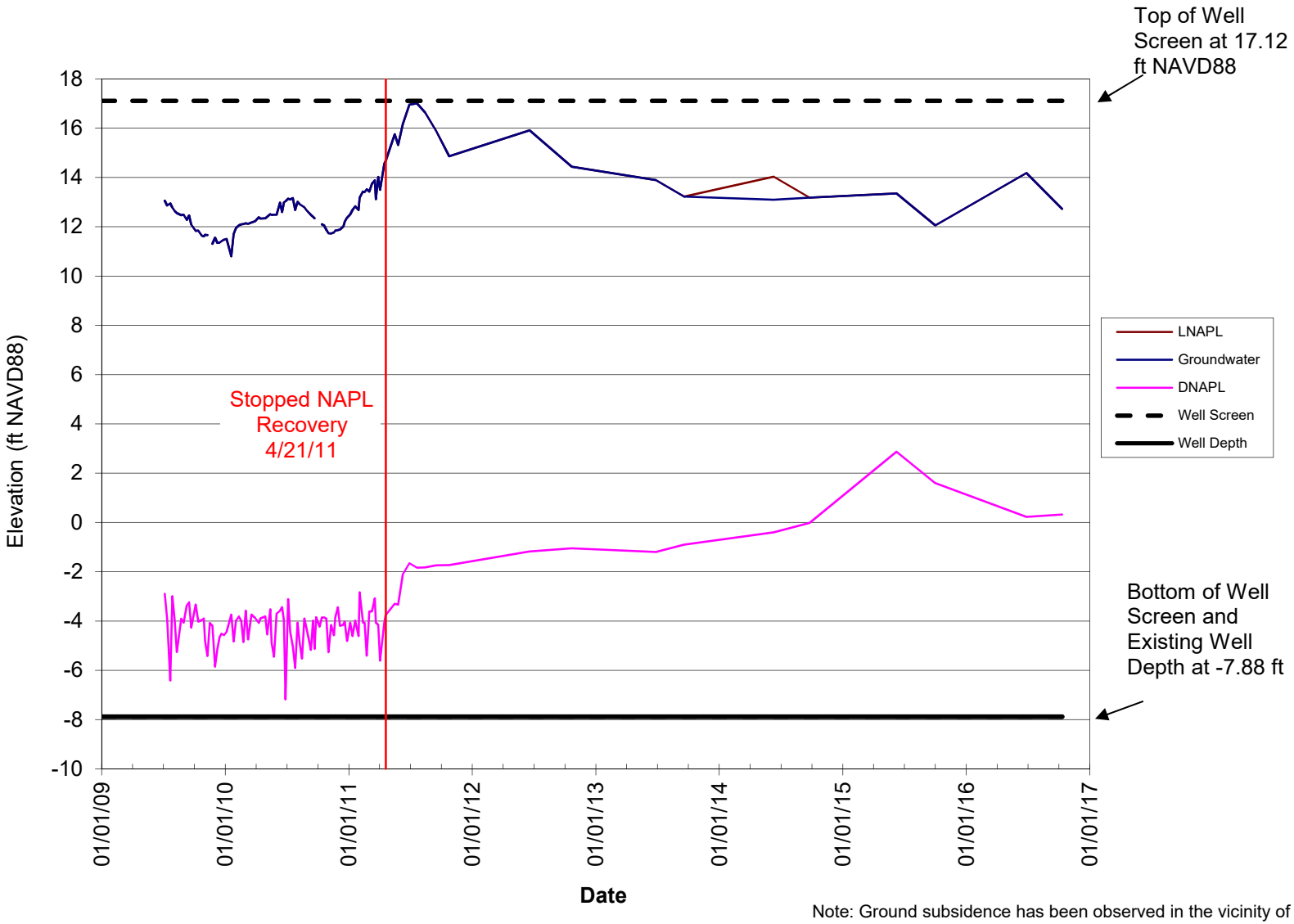
Figure

4-20



Note: Ground subsidence has been observed in the vicinity of EW-1s and the well casing has sunk over time. The screened interval and total well depth have been referenced to the most recent ground survey from September 2009. Given that the elevations are changing with time, the elevations shown are approximate.

McCormick and Baxter Superfund Site
Portland, Oregon

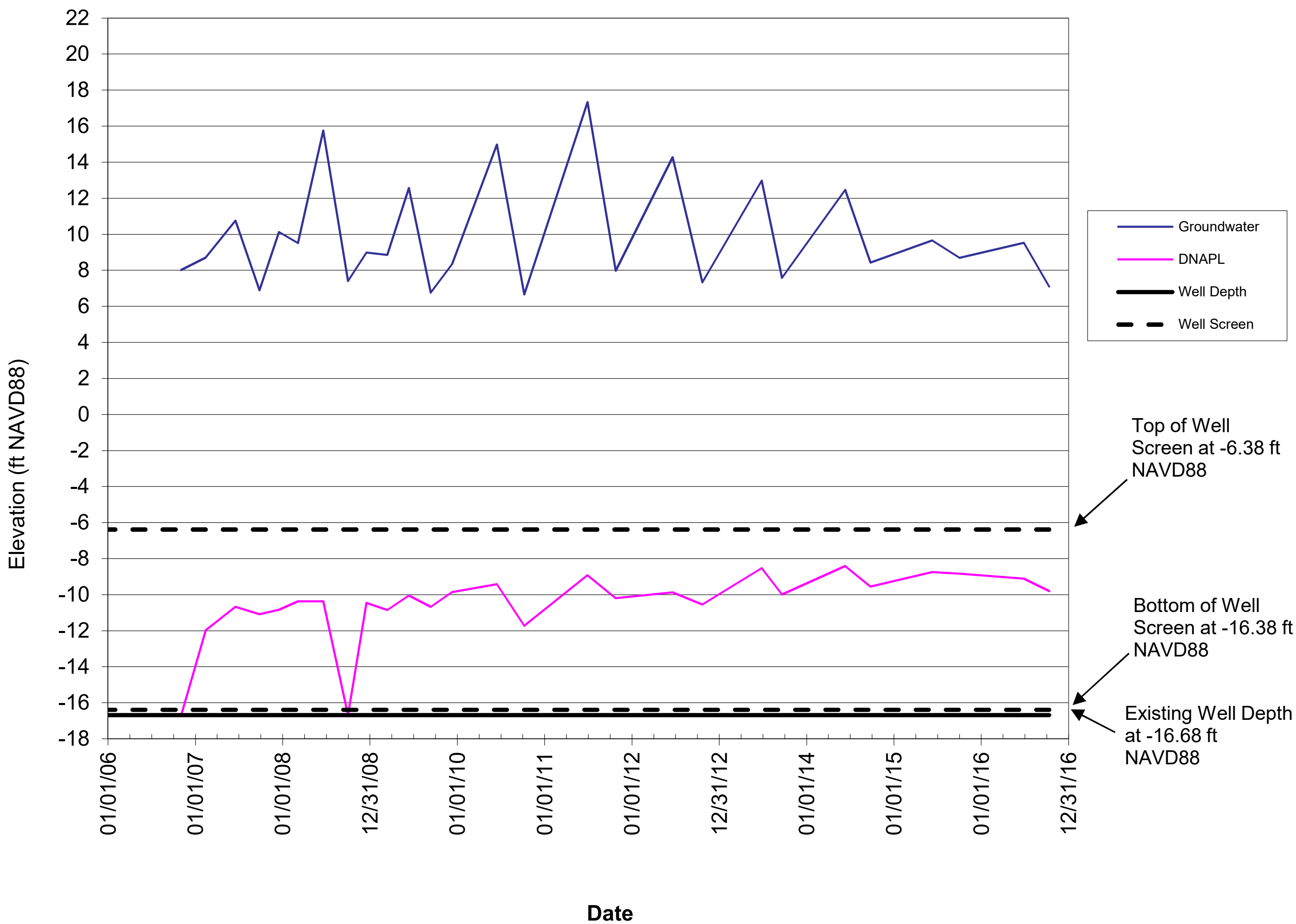
2009 to 2016 NAPL Thickness Plot for Well EW-1s

12/2016

Figure
4-21

HARTCROWSER

GSI Water Solutions, Inc.



HARTCROWSER

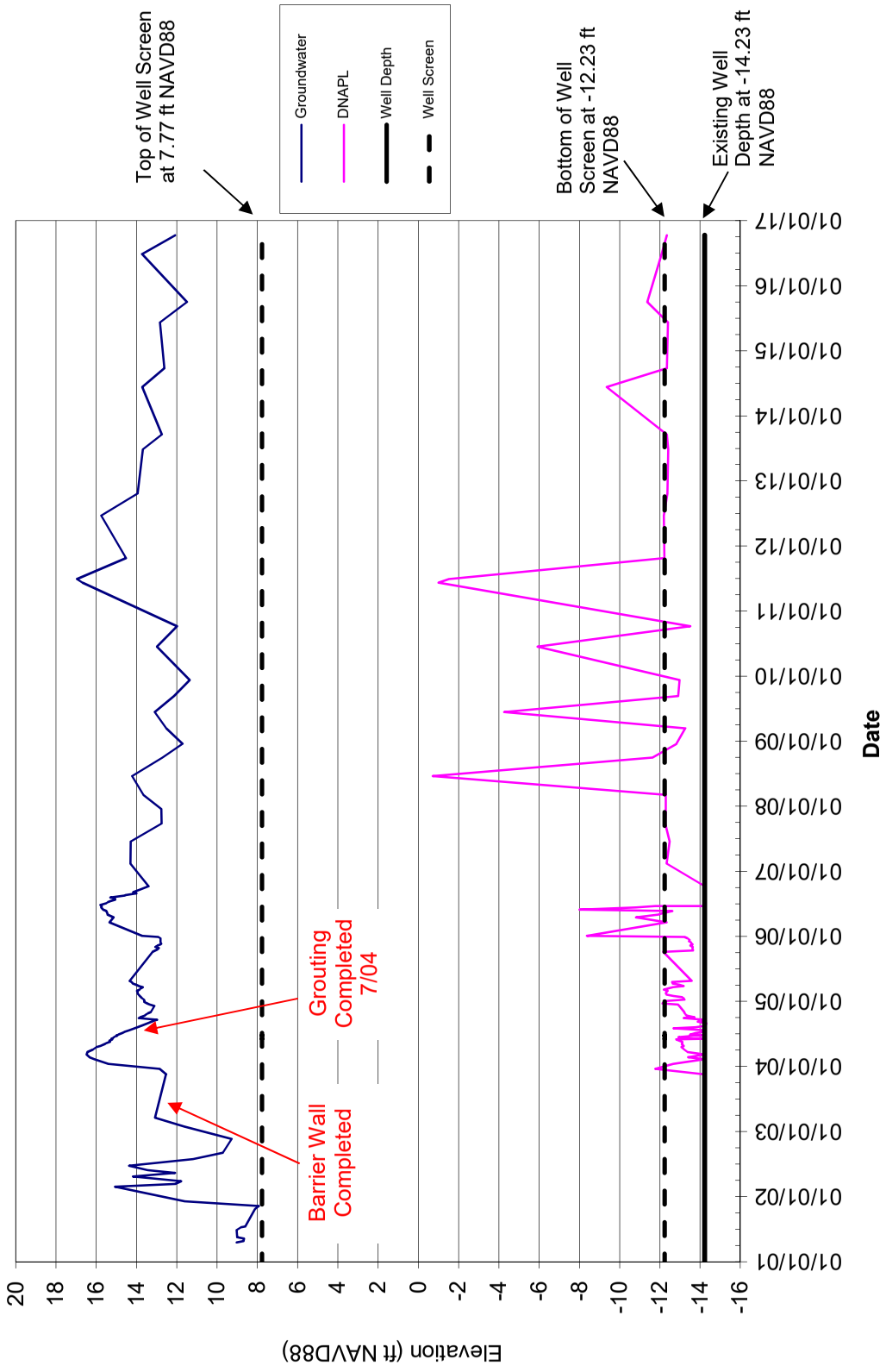
GSI Water Solutions, Inc.

2006 to 2016 NAPL Thickness Plot for Well MW-22i

McCormick and Baxter Superfund Site
Portland, Oregon

12/2016

Figure
4-22



McCormick and Baxter Superfund Site
Portland, Oregon

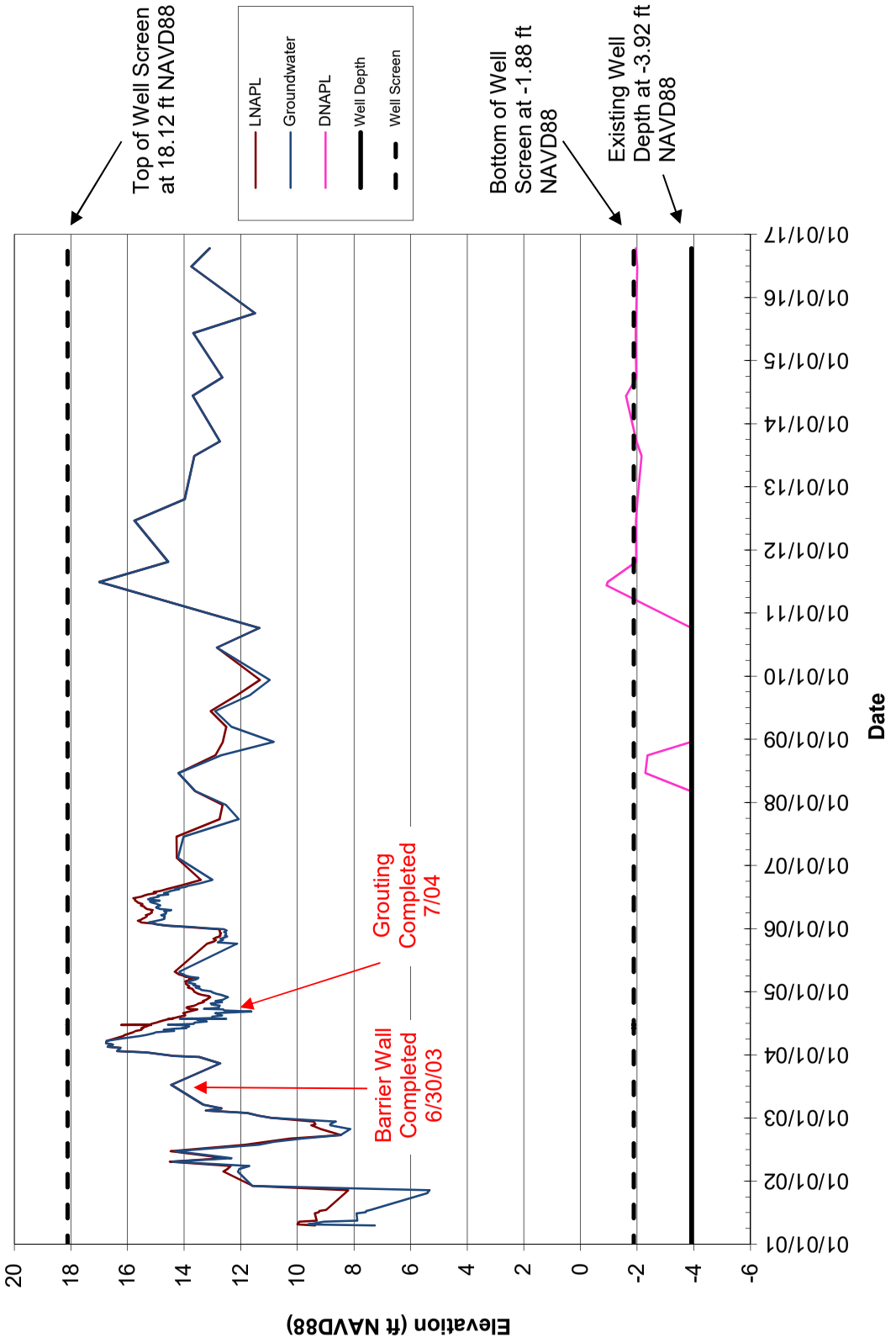
2001 to 2016 NAPL Thickness Plot for Well EW-8s

12/2016

HARTCROWSER GSI Water Solutions, Inc.

Figure

4-23



McCormick and Baxter Superfund Site
Portland, Oregon

2001 to 2016 NAPL Thickness Plot for Well EW-18s

12/2016

HARTCROWSER GSI Water Solutions, Inc.

Figure

4-24

ENTRANCE AREA

Fence (Typ.)

Property Line

Gravel Road

Union Pacific Railroad

Gate

DRAINAGE SWALE

EARTHEN CAP

Barrier Wall

Stormwater Retention Pond

Riprap

IMPERMEABLE CAP

Rock Pile

RIPARIAN AREA

Burlington Northern Inc.
(Spokane, Portland, and Seattle Railway Co.)

Willamette Cove

Sand Pile

SEDIMENT CAP

Willamette River

1 Photograph Location, Number, and Direction Taken

0 200 400
Scale in Feet

McCormick and Baxter Superfund Site
Portland, Oregon

Site Plan

2/17

HARTCROWSER GSI Water Solutions, Inc.

Figure
5-1

File: \\Pdxsrv\data\Notebooks\1567010_DEQ McCormick & Baxter O&M\CAD\1567010_(Site Plan).dwg Layout:SitePlan Date: 02-23-2017 Author: melissaschweitzer

APPENDIX A
Photograph Log – Site Activities and Observations

Photograph 1 – Animal burrow located along north fence.

Photograph 2 – Filled in animal burrow located along north fence.

Photograph 3 – Repaired sign at southeast corner of site, looking north.

Photograph 4 – Repaired fence – July 2016.

Photograph 5 –Repairs to trailer siding caused by birds.

Photograph 6 –Trailer tarped to prevent further leaks from holes in siding.

Photograph 7 – Red tail hawk observed during June 2016 vegetation inspection.

Photograph 8 – Vessels moored in Willamette Cove – November 2016.

Photograph 9 – Healthy trees adjacent to trees that perished during the 2016 summer drought – June 2016.

Photograph 10 – Typical habitat gravel within ACB armoring along the Willamette River – November 2016.

Photograph 11 – Looking north at TRM repairs during June 2016 vegetation inspection.

Photograph 12 – Lower portion of the ACB armoring in November 2016.

Photograph 13 – Sediment cap looking south in July 2016.

Photograph 14 – Inner casing measuring point on well MW-23d.

Photograph 15 – Stormwater drainage at outfall during January 2016 site inspection.

Photograph 16 – Typical habitat gravel within ACB armoring in Willamette Cove – November 2016.

Photograph 17 – Pacific wax myrtle (Myrica gale) planted during TRM repairs in December 2015 as observed in during January 2016 site inspection.

APPENDIX B

Site Activity Documentation

Site Sign in Sheets

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
1/20/16	10:40	AM	16:00	pm	Kaylan Smyth	Hart Crowser	Maintenance
1/22/16	0935	AM	1055	PM	Phil Cordell	" "	Site Inspection
					Erin Carol Hughes	" GSI "	
					Sarah Miller	" DEQ "	
2/4/16	0800	AM	1630	PM	Phil Cordell	HC	Transducer Install
	0800				Kaylan Smyth	HC	" "
	0830				Renee Fowler	GSI	" "
2/19/16	1030	AM	1530	PM	Phil Cordell	HC	O&M - Transducer
3/17/16	1345	PM	1500	PM	Phil Cordell	HC	Replace Sump Pump
3/31/16	1300	PM	1600	PM	Phil Cordell	HC	Replace EW-1 Transducer
4/20/16	8:25	AM	094		Erin Hughes	GSI	Site Walk - Quarterly
	8:40	AM	1040		Phil Cordell	HC	
	8:35	AM	940		Sarah Miller	DEQ	
6/22	8:30	AM	10:00		Kaylan Smyth	HC	Drum Pick-up
6/27	8:00	AM	12:30	PM	Kaylan Smyth	HC	Water Levels
6/27	"	"	12:00	PM	Chris Martin	HC	" "
6/27	8:00	AM	12:00	PM	Anthony Chavez		

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
6/27	10:15	AM	14:00		Phil Cordell	HC	Transducer
7/21	0945	am	1600		Phil Cordell	HC	Site Inspection
7/21	0945	am	1200		Sarah Miller	DEQ	" "
7/21	945	am	1200		Erin Hughes	GSI	" "
7/21	945	am	1200		Annie Christopher	EPA	" "
7/27	1300	PM	1600	PM	Phil Cordell	HC	O&M
8/10	1100	AM	1300		Phil Cordell	HC	replace alarm batt
9/9/16	0400	AM	12:40	PM	Phil Cordell	HC	equipment removal
9/9	9:00	AM	1200	PM	Ken Cameron	DEQ	Equipment removal
9/9	900		1200	PM	Sarah Miller	DEQ	" "
9/9	915	AM	1345	PM	Greg Coffeen	DEQ	Surplus equip. reassignment
10/11	8:15	AM	13:40		Kaylan Smyth	HC	GW. Monitoring
10/11	830	AM	13:40		Anthony August	HCI	"
10/11	8:30	AM	13:40		Phil Cordell	HC	"
10/18	1315		16:00		KAYLAN SMYTH	HC	Maintenance
11/8	0850	~~AM~~ 0930	0930	AM	Phil Cordell	HC	"
11/17	1330	~~AM~~ 1500	1500		Sarah Miller	DEQ	Site Inspection

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
11/17	1330		1500		Erin Hughes	DEQ	Site Inspection
11/17	1320		1520		Phil Lordell	HC	Site Inspection
12/14/16	1100	AM	1330		Kaylan Smyth	HC	Site Inspection
12/16/16	1430		1630		Kaylan Smyth	HC	" "
12/20/16	9:15		1600		Kaylan Smyth	HC	Transducer Monitor/Install
1/19/18					Phil Lordell		

APPENDIX B

Site Activity Documentation

Site Inspection Meeting and Observation Forms

McCormick & Baxter Operational & Functional Determination Period Status Meeting Report

Friday 1/22/2016
9:00 A.M.
6900 N. Edgewater Street
Portland, OR 97203

Meeting called by:	Oregon Department of Environmental Quality (DEQ)	Type of Meeting:	Quarterly Progress Meeting
Facilitator:	Sarah Miller	Note Taker:	Phil Cordell
Attendees:	Sarah Miller	Project Officer	DEQ
	Phil Cordell	Site Manager	Hart Crowser
	Erin Hughes	Hydrogeologist	GSI

Site Status Meeting Notes

Site Walk and Inspection

The attendees completed a thorough inspection of the entire site on Friday, January 22, 2015. The next inspection is scheduled for April 2016.

Site Walk – Shoreline

The following items were inspected during both the shoreline site walk and inspection:

- Gravel overlay on ACB.
- Buoy locations.
- Stormwater discharge.
- Willamette River and Willamette Cove shoreline conditions.
- Ebullition from sediment cap.
- Shoreline vegetation repairs.

Gravel from the shoreline enhancement task (completed in October 2012) remains settled in the voids of the ACB armoring. Tidal fluctuations have distributed gravel from the top of the ACB, where it was originally applied, to where it has settled along the toe of the bank. Gravel has not settled into the mid-bank portion of the ACB armoring in areas where the slope is steeper.

The Willamette River at the time of inspection (between 9:00 AM and 11:00 AM) was between 8.10 and 8.43 feet COP (or 13.10 – 13.43 NAVD88). Low tide was at approximately 9:30 AM with a tide of approximately 8.07 feet COP (or 13.07 NAVD88). All buoys were visible.

Discharge from the outfall was estimated at 20-25 gallons per minute. The outfall is in good condition.

Approximately 7 derelict boats anchored within Willamette Cove were observed during the site walk. The river level was relatively high, so the shoreline is relatively clean and free of debris.

No ebullition was observed in the area above the granular organoclay along the Willamette River shoreline, and due to high water levels, we could not directly observe the sediment cap within Willamette Cove.

Wildlife spotted along the shoreline included Canada geese and seagulls.

In December 2015, shoreline repairs were completed in certain areas where soil had eroded from beneath the turf-reinforced matting (TRM) above the ACB. The repairs involved pulling up the TRM, placing new soil, and planting shrubs in areas where erosion was observed. The repairs and planted vegetation appeared to be in good condition.

Site Walk – Upland

The following items were inspected during the upland site walk and inspection:

- Site perimeter and fence, and drainage basin.
- Subsurface drainage (manholes).
- Soil cap (burrows, erosion, etc.).
- EW-1s and MW-23d area of subsidence.

The site perimeter fence was intact, with some areas of burrowing identified (small mammal sized burrows). A few large burrows (~1 foot deep) were observed along the gravel roads.

Stormwater drainage was observed by opening a manhole SDMH-B. This coupled with the discharge from the stormwater outfall indicate that the stormwater drainage system within the RCRA-style soil cap is functioning as designed.

The distance between the inner and outer casing of MW-23d was 2.94 inches, slightly greater than previous measurements, but likely a result of measuring differences (e.g., human error). The reading will be double checked on February 4, 2016.

Various small birds and scat were spotted in the upland portion of the cap. Feathers and scat observed near EW-1s/MW-23d suggest coyote activity at the site.

The job trailer roof was observed to be leaking and Hart Crowser will return to the site and place a tarp over the trailer. The trailers appear to be rapidly deteriorating and planning to remove them should begin.

Action Items:	**Person Responsible**	**Deadline**
■ Continue to Monitor MW-23d inner/outer casing relationship for movement.	Phil Cordell	Quarterly
■ Herbicide application	Phil Cordell	Spring 2016
■ Winter transducer inspection and install 4 new transducers	Phil Cordell	February 2016
■ Fill large burrows along perimeter road	Phil Cordell	February 2016
■ Cover job trailer	Phil Cordell	February 2016

Site Activities / Miscellaneous Field Activities

- Shoreline repairs and irrigation system decommissioning were completed in December 2015.

Deliverables

None submitted.

Action Item:	Person Responsible:	Deadline:
Hart Crowser and GSI will submit Draft 2015 O&M Annual Report.	Phil Cordell/Erin Hughes	February 2016
Hart Crowser and GSI will assist DEQ with the five year review	Phil Cordell/Erin Hughes	Spring 2016
Hart Crowser and GSI will update the O&M Manual	Phil Cordell/Erin Hughes	February 2016

Budget Status: November 2015 through January 2016 were at/or below the anticipated budget.

Meeting Status:

Date / Time	TBD – January 2016	
Location	McCormick & Baxter Facility	Site Office

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 1/22/2016 Time: 09:00

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None observed
High temp (weekly)	48
Low temp (weekly)	36
Wind (daily)	Light <5mph
Precipitation (weekly)	2.67 inches (1/17/16-1/23/16)
Erosion	
Around Manholes	None observed
Headway retention pond	None observed
Eastern edge of property	None observed
Spillway area	None observed
Outfall area	None observed
Animal burrows / disturbance	Fair - some burrows observed, but none determined to compromise the cap
Manhole conditions	
Debris, flow, general condition	No debris, moderate to high flow at 20-25 gpm
Flow in collection piping	Moderate to high flow at 20-25 gpm
Outfall and Spillway	
Note approx. flow volume	Moderate to high flow at 20-25 gpm
Vegetation Conditions	Fair
Wildlife	Canada Geese and seagulls
Daily activities	Site inspection
Observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 1/22/2016 Time: 09:00

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure
high temp (weekly)	Good
low temp (weekly)	48
wind (weekly)	36
precipitation (weekly)	2.67 inches (1/17/16-1/23/16)
Sheen Observations (low tide)	None observed
Size and Location	None observed
Source (gas bubble, debris, etc.)	None observed
ACB and Riprap Armoring	Good
Changes in Location	None observed
Displaced blocks	None observed
Vandalism	None observed
River relative to top of ACB	
Organoclay Mats (extreme low water)	None observed
Edges of mats visible?	None observed
Overlying Armoring conditions	Good
Evidence of movement?	None observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	None observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Good
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

McCormick & Baxter Operational & Functional Determination Period Status Meeting Report

Wednesday 4/20/2016
8:30 A.M.
6900 N. Edgewater Street
Portland, OR 97203

Meeting called by:	Oregon Department of Environmental Quality (DEQ)	Type of Meeting:	Quarterly Progress Meeting
Facilitator:	Sarah Miller	Note Taker:	Phil Cordell
Attendees:	Sarah Miller	Project Officer	DEQ
	Phil Cordell	Site Manager	Hart Crowser
	Erin Hughes	Hydrogeologist	GSI

Site Status Meeting Notes

Site Walk and Inspection

The attendees completed a thorough inspection of the entire site on Wednesday, April 20, 2016. The next inspection is scheduled for July 2016.

Site Walk – Shoreline

The following items were inspected during both the shoreline site walk and inspection:

- Gravel overlay on ACB.
- Buoy locations.
- Stormwater discharge.
- Willamette River and Willamette Cove shoreline conditions.
- Ebullition from sediment cap.
- Shoreline vegetation repairs.

Gravel from the shoreline enhancement task (completed in October 2012) remains settled in the voids of the ACB armoring. Tidal fluctuations have distributed gravel from the top of the ACB, where it was originally applied, to where it has settled along the toe of the bank. Gravel has not settled into the mid-bank portion of the ACB armoring in areas where the slope is steeper.

The Willamette River at the time of inspection (between 8:30 AM and 10:00 AM) was between 9.06 and 8.85 feet COP (or 14.06 – 13.85 NAVD88). Low tide was at approximately 2:00 AM with a tide of approximately 8.42 feet COP (or 13.24 NAVD88). All buoys were visible.

Discharge from the outfall was estimated at 1 gallon per minute. The outfall is in good condition, but moss is covering much of it.

Eight derelict boats anchored within Willamette Cove were observed during the site walk. The river level was relatively high, so the shoreline is relatively clean and free of debris.

No ebullition was observed in the area above the granular organoclay along the Willamette River shoreline, and due to high water levels, we could not directly observe the sediment cap within Willamette Cove. We will inspect the cap during O&M activities planned later this month.

Wildlife spotted along the shoreline included Canada geese and seagulls.

In December 2015, shoreline repairs were completed in certain areas where soil had eroded from beneath the turf-reinforced matting (TRM) above the ACB. The repairs involved pulling up the TRM, placing new soil, and planting shrubs in areas where erosion was observed. The repairs and planted vegetation appeared to be in good condition.

Site Walk – Upland

The following items were inspected during the upland site walk and inspection:

- Site perimeter and fence, and drainage basin.
- Subsurface drainage (manholes).
- Soil cap (burrows, erosion, etc.).
- EW-1s and MW-23d area of subsidence.

The site perimeter fence was intact, with some areas of burrowing identified (small mammal sized burrows). A few large burrows (~1 foot deep) were observed along the gravel roads. Minor damage to the perimeter fence was observed along the east fence line. Repairs will be made this spring.

Stormwater drainage (minimal) was observed by opening manhole SDMH-B. This coupled with the discharge from the stormwater outfall indicate that the stormwater drainage system within the RCRA-style soil cap is functioning as designed.

The distance between the inner and outer casing of MW-23d was 2.75 inches, which is consistent with recent measurements.

Various small birds and scat were spotted in the upland portion of the cap. Lots of animal burrows were observed around the site and coyotes have been recently spotted.

The job trailer leaks were repaired this winter, but birds have already made new holes in the trailer and are living in the walls. The trailers are rapidly deteriorating and planning to remove them has begun.

Action Items:	Person Responsible	Deadline
■ Continue to Monitor MW-23d inner/outer casing relationship for movement.	Phil Cordell	Quarterly
■ Herbicide application	Phil Cordell	May 2016
■ Install replacement EW-1 transducer cable	Phil Cordell	May 2016
■ Fill large burrows along perimeter fence and interior of the site	Phil Cordell	May/June 2016
■ Repair perimeter fence	Phil Cordell	May/June 2016
■ Vegetation Inspection	Phil Cordell	June 2016

Site Activities / Miscellaneous Field Activities

- The EW-1 transducer was replaced.
- A new sump pump was installed in the drum storage area.
- The job trailer leaks were sealed.

Deliverables

None submitted.

Action Item:	Person Responsible:	Deadline:
Hart Crowser and GSI submitted the Draft 2015 O&M Annual Report	Phil Cordell/Erin Hughes	May 6, 2016
Hart Crowser and GSI will assist DEQ with the five year review	Phil Cordell/Erin Hughes	Ongoing – Due September 2016
Hart Crowser and GSI will submit an updated O&M Manual	Phil Cordell/Erin Hughes	May 2016

Budget Status: January 2016 through April 2016 were at/or below the anticipated budget.

Meeting Status:

Date / Time	TBD – July 2016	
Location	McCormick & Baxter Facility	Site Office

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 4/20/2016 Time: 08:30

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure
high temp (weekly)	Good
low temp (weekly)	64 deg F
wind (weekly)	45 deg F
precipitation (weekly)	0.55 inches (4/17/16-4/23/16)
Sheen Observations (low tide)	None observed
Size and Location	None observed
Source (gas bubble, debris, etc.)	None observed
ACB and Riprap Armoring	Good
Changes in Location	None observed
Displaced blocks	None observed
Vandalism	None observed
River relative to top of ACB	
Organoclay Mats (extreme low water)	None observed
Edges of mats visible?	None observed
Overlying Armoring conditions	Good
Evidence of movement?	None observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	None observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Good
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 4/20/2016 Time: 08:30

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure
high temp (weekly)	Good
low temp (weekly)	64 deg F
wind (weekly)	45 deg F
precipitation (weekly)	0.55 inches (4/17/16-4/23/16)
Sheen Observations (low tide)	None observed
Size and Location	None observed
Source (gas bubble, debris, etc.)	None observed
ACB and Riprap Armoring	Good
Changes in Location	None observed
Displaced blocks	None observed
Vandalism	None observed
River relative to top of ACB	
Organoclay Mats (extreme low water)	None observed
Edges of mats visible?	None observed
Overlying Armoring conditions	Good
Evidence of movement?	None observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	None observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Good
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

McCormick & Baxter Operational & Functional Determination Period Status Meeting Report

Wednesday 7/21/2016
9:00 A.M.
6900 N. Edgewater Street
Portland, OR 97203

Meeting called by:	Oregon Department of Environmental Quality (DEQ)	Type of Meeting:	Quarterly Progress Meeting
Facilitator:	Sarah Miller	Note Taker:	Phil Cordell
Attendees:	Sarah Miller	Project Officer	DEQ
	Phil Cordell	Site Manager	Hart Crowser
	Erin Hughes	Hydrogeologist	GSI
	Anne Christopher	Project Manager	EPA

Site Status Meeting Notes

Site Walk and Inspection

The attendees completed a thorough inspection of the entire site on Thursday, July 21, 2016. The next inspection is scheduled for October 2016.

Site Walk – Shoreline

The following items were inspected during both the shoreline site walk and inspection:

- Gravel overlay on ACB.
- Buoy locations.
- Stormwater discharge.
- Willamette River and Willamette Cove shoreline conditions.
- Ebullition from sediment cap.
- Shoreline vegetation repairs.

Gravel from the shoreline enhancement task (completed in October 2012) remains settled in the voids of the ACB armoring. Tidal fluctuations have distributed gravel from the top of the ACB, where it was originally applied, to where it has settled along the toe of the bank. Gravel has not settled into the mid-bank portion of the ACB armoring in areas where the slope is steeper; however, vegetation was observed to be growing in the ACB voids.

The Willamette River at the time of inspection (between 9:00 AM and 11:30 AM) was between 4.95 and 4.06 feet COP (or 9.95 – 9.06 NAVD88). Low tide was at approximately 4:15 PM with a tide of approximately 2.55 feet COP (or 7.55 NAVD88). All buoys were visible.

Discharge from the outfall was estimated at <1 gallon per minute. The outfall is in good condition, but moss is covering much of it.

Six derelict boats anchored within Willamette Cove were observed during the site walk. The river level was relatively high, but the ACB in Willamette Cove and along the Willamette River was exposed and relatively clean and free of debris; however, a large amount of drift wood has been deposited along the Willamette River shoreline.

Little ebullition was observed in the area above the granular organoclay along the Willamette River shoreline and in Willamette Cove during the inspection; however, moderate ebullition was observed in the Willamette River later in the day when the river level was lower.

Wildlife spotted along the shoreline included Canada geese.

In December 2015, shoreline repairs were completed in certain areas where soil had eroded from beneath the turf-reinforced matting (TRM) above the ACB. The repairs involved pulling up the TRM, placing new soil, and planting shrubs in areas where erosion was observed. The repairs look good, but the willows planted at the top of the ACB appear to have perished or have gone dormant. The other vegetation seemed to be relatively healthy, but appeared slightly stressed from lack of water. Hart Crowser watered the newly planted shoreline vegetation following the site inspection.

Red-brown iron staining was observed on gravel along the Willamette River shoreline that extended north approximately 200 feet from the southern COP outfall. This is consistent with previous observations of staining in this area.

ACB wire loops were exposed in the southern portion of the ACB. Hart Crowser will cut these during a future O&M site visit.

Site Walk – Upland

The following items were inspected during the upland site walk and inspection:

- Site perimeter and fence, and drainage basin.
- Subsurface drainage (manholes).
- Soil cap (burrows, erosion, etc.).
- EW-1s and MW-23d area of subsidence.

The site perimeter fence was intact, with some areas of burrowing identified (small mammal sized burrows). A few large burrows (~1 foot deep) were observed along the gravel roads. Minor damage to the perimeter fence was observed along the east fence line. Repairs were made on July 27, 2016.

Little stormwater drainage was observed by opening manhole SDMH-B. This coupled with the discharge from the stormwater outfall indicate that the stormwater drainage system within the RCRA-style soil cap is functioning as designed.

The distance between the inner and outer casing of MW-23d was 2.75 inches, which is the same as recent measurements. The inspection team decided that the TOC elevation of MW-23d and EW-2s should be re-surveyed by Hart Crowser to confirm that settlement in the area has slowed or ceased.

Various small birds and scat were spotted in the upland portion of the cap. Lots of animal burrows were observed around the site and coyotes have been recently spotted.

The job trailer leaks were repaired this winter, but birds have already made new holes in the trailer and are living in the walls. The trailers are rapidly deteriorating and plans to remove them, the storage container, and other unnecessary equipment are being overseen by the DEQ.

Action Items:	Person Responsible	Deadline
■ Continue to Monitor MW-23d inner/outer casing relationship for movement.	Phil Cordell	Quarterly
■ Survey MW-23d and EW-1s	Phil Cordell	Summer 2016
■ Watering events	Phil Cordell	As needed
■ Fill large burrows along perimeter fence and interior of the site	Phil Cordell	Summer 2016
■ Repair perimeter fence	Phil Cordell	Completed July 2016
■ Low Tide Monitoring	Phil Cordell	October 2016
■ Coordinated trailer/surplus equipment removal and organize trailer/shop.	Sarah Miller/Phil Cordell	Summer/Fall 2016
■ Publish public notification of the Five Year Review on Oregon Live prior to issuing the Report.	Annie Christopher	Summer 2016

Site Activities / Miscellaneous Field Activities

- The low-tide monitoring occurred in June 2016.
- The vegetation inspection occurred in June 2016.
- The EW-2s transducer cable was replace in June 2016.

Deliverables

The 2015 Annual Report and the revised O&M Manual was submitted in June 2016. The draft Five Year Review was also submitted to the DEQ in June 2016.

Action Item:	Person Responsible:	Deadline:
Hart Crowser and GSI will continue to assist the DEQ with the Five Year review	Phil Cordell/Erin Hughes	Ongoing – Due September 2016

Budget Status: April 2016 through June 2016 were at/or below the anticipated budget.

Meeting Status:

Date / Time	TBD – October 2016	
Location	McCormick & Baxter Facility	Site Office

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 7/21/2016 Time: 09:00

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None observed
High temp (weekly)	81 deg F
Low temp (weekly)	58 deg F
Wind (daily)	Light <5mph
Precipitation (weekly)	0.02 inches (7/17/16-4/23/16)
Erosion	
Around Manholes	None observed
Headway retention pond	None observed
Eastern edge of property	None observed
Spillway area	None observed
Outfall area	None observed
Animal burrows / disturbance	Fair - some burrows observed, but none determined to compromise the cap
Manhole conditions	
Debris, flow, general condition	No debris, low <1 gpm
Flow in collection piping	Low <1 gpm
Outfall and Spillway	
Note approx. flow volume	Low <1 gpm
Vegetation Conditions	Fair
Wildlife	Canada Geese
Daily activities	Site inspection
Observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 7/21/2016 Time: 09:00

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure
high temp (weekly)	81 deg F
low temp (weekly)	58 deg F
wind (weekly)	<5mph
precipitation (weekly)	0.02 inches (7/17/16-4/23/16)
Sheen Observations (low tide)	None observed
Size and Location	None observed
Source (gas bubble, debris, etc.)	None observed
ACB and Riprap Armoring	Good
Changes in Location	None observed
Displaced blocks	None observed
Vandalism	None observed
River relative to top of ACB	
Organoclay Mats (extreme low water)	None observed
Edges of mats visible?	None observed
Overlying Armoring conditions	Good
Evidence of movement?	None observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	None observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Good
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

McCormick & Baxter Operational & Functional Determination Period Status Meeting Report

Wednesday 11/17/2016
9:00 A.M.
6900 N. Edgewater Street
Portland, OR 97203

Meeting called by:	Oregon Department of Environmental Quality (DEQ)	Type of Meeting:	Quarterly Progress Meeting
Facilitator:	Sarah Miller	Note Taker:	Phil Cordell
Attendees:	Sarah Miller	Project Officer	DEQ
	Phil Cordell	Site Manager	Hart Crowser
	Erin Hughes	Hydrogeologist	GSI

Site Status Meeting Notes

Site Walk and Inspection

The attendees completed a thorough inspection of the entire site on Thursday, November 17, 2016. The next inspection is scheduled for January or February 2017.

Site Walk – Shoreline

The following items were inspected during both the shoreline site walk and inspection:

- Gravel overlay on ACB.
- Buoy locations.
- Stormwater discharge.
- Willamette River and Willamette Cove shoreline conditions.
- Ebullition from sediment cap.
- Shoreline vegetation repairs.

Gravel from the shoreline enhancement task (completed in October 2012) remains settled in the voids of the ACB armoring. Tidal fluctuations have distributed gravel from the top of the ACB, where it was originally applied, to where it has settled along the toe of the bank. Gravel has not settled into the mid-bank portion of the ACB armoring in areas where the slope is steeper; however, vegetation was observed to be growing in the ACB voids.

The Willamette River at the time of inspection (between 1:30 PM and 300 PM) was between 5.70 and 5.55 feet COP (or 10.70 – 10.55 NAVD88). Low tide was at approximately 3:30 PM with a tide of approximately 5.20 feet COP (or 10.20 NAVD88). All buoys were visible.

Discharge from the outfall was estimated at 15 gallons per minute. The outfall is in good condition, but moss is covering much of it.

Eleven derelict boats anchored within Willamette Cove were observed during the site walk. The river level was relatively high, but the upper sections of ACB in Willamette Cove was exposed and relatively clean and free of debris; however, a large amount of drift wood has been deposited along the Willamette River shoreline.

Little ebullition was observed in the area above the granular organoclay along the Willamette River shoreline and in Willamette Cove during the inspection.

Wildlife spotted along the shoreline included Canada geese.

In December 2015, shoreline repairs were completed in certain areas where soil had eroded from beneath the turf-reinforced matting (TRM) above the ACB. The repairs involved pulling up the TRM,

placing new soil, and planting shrubs in areas where erosion was observed. The repairs look good, but much of the vegetation planted along the top of the bank has perished; however, native grasses, shrubs, and weeds have started growing and the area appears to have stabilized (no erosion evident).

Red-brown iron staining was observed on gravel along the Willamette River shoreline that extended north approximately 200 feet from the southern COP outfall. This is consistent with previous observations of staining in this area.

ACB wire loops were exposed in the southern portion of the ACB. Hart Crowser will cut these during a future O&M site visit.

Site Walk – Upland

The following items were inspected during the upland site walk and inspection:

- Site perimeter and fence, and drainage basin.
- Subsurface drainage (manholes).
- Soil cap (burrows, erosion, etc.).
- EW-1s and MW-23d area of subsidence.

The site perimeter fence was intact, with some areas of burrowing identified (small mammal sized burrows). A few larger burrows (~0.5 foot deep) were observed along the gravel roads but only appear to be providing a point of access for the coyote that is frequently observed at the site.

Stormwater drainage at approximately 15 gpm was observed by opening manhole SDMH-B. This coupled with the discharge from the stormwater outfall indicate that the stormwater drainage system within the RCRA-style soil cap is functioning as designed.

The distance between the inner and outer casing of MW-23d was 2.75 inches, which is the same as recent measurements.

Various small birds and scat were spotted in the upland portion of the cap. Lots of animal burrows were observed around the site and coyotes have been recently spotted.

The job trailer leaks were repaired this winter, but birds have already made new holes in the trailer and are living in the walls. The trailers are rapidly deteriorating and plans to remove them are progressing.

Action Items:	Person Responsible	Deadline
■ Continue to Monitor MW-23d inner/outer casing relationship for movement.	Phil Cordell	Quarterly
■ Draft Annual Report	Phil Cordell/Erin Hughes	February 2016
■ Coordinated trailer/surplus equipment removal and organize trailer/shop.	Sarah Miller/Phil Cordell	January-February 2016
■ Transducer replacement and winter download.	Phil Cordell	Completed December 2016

Site Activities / Miscellaneous Field Activities

- The low-tide monitoring occurred in October 2016.
- The vegetation inspection occurred in October 2016.
- Backflow preventer testing occurred in September 26.

Deliverables

The final Five Year Review was submitted to the DEQ on September 29, 2016.

Action Item:	Person Responsible:	Deadline:
Hart Crowser and GSI will prepare the 2016 Annual Report.	Phil Cordell/Erin Hughes	February 2016

Budget Status: June 2016 through November 2016 were at/or below the anticipated budget.

Meeting Status:

Date / Time	TBD – January - February 2016	
Location	McCormick & Baxter Facility	Site Office

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 11/17/2016 Time: 09:00

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None observed
High temp (weekly)	81 deg F
Low temp (weekly)	58 deg F
Wind (daily)	Light <5mph
Precipitation (weekly)	1.4 (11/13/16-11/19/16)
Erosion	
Around Manholes	None observed
Headway retention pond	None observed
Eastern edge of property	None observed
Spillway area	None observed
Outfall area	None observed
Animal burrows / disturbance	Fair - some burrows observed, but none determined to compromise the cap
Manhole conditions	
Debris, flow, general condition	No debris,~15 gpm, good condition.
Flow in collection piping	~15 gpm
Outfall and Spillway	
Note approx. flow volume	~15 gpm
Vegetation Conditions	Fair
Wildlife	Canada Geese
Daily activities	Site inspection
Observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 11/17/2016 Time: 09:00

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure
high temp (weekly)	81 deg F
low temp (weekly)	58 deg F
wind (weekly)	<5mph
precipitation (weekly)	1.4 (11/13/16-11/19/16)
Sheen Observations (low tide)	None observed
Size and Location	None observed
Source (gas bubble, debris, etc.)	None observed
ACB and Riprap Armoring	Good
Changes in Location	None observed
Displaced blocks	None observed
Vandalism	None observed
River relative to top of ACB	
Organoclay Mats (extreme low water)	None observed
Edges of mats visible?	None observed
Overlying Armoring conditions	Good
Evidence of movement?	None observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	None observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Good
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

APPENDIX B

Site Activity Documentation

Waste Disposal Documentation

447547

CWMI

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
ORD009020603	1	(800) 424-9300	014926250 JJK

GENERATOR

5. Generator's Name and Mailing Address
OR DEQ, c/o HART CROWSER, INC
8910 SW GEMINI DRIVE
BEAVERTON OR 97008

Generator's Site Address (if different than mailing address)
OREGON DEPT ENVIRONMENTAL QLTY
6900 N EDGEWATER AVE
PORTLAND OR 97203-5012

Generator's Phone: (503) 229-6748

6. Transporter 1 Company Name
CHEMICAL WASTE MANAGEMENT OF THE NW, INC.

U.S. EPA ID Number
ORD089452353

7. Transporter 2 Company Name

U.S. EPA ID Number

8. Designated Facility Name and Site Address
CWMINW, INC.
17629 CEDAR SPRINGS LANE
ARLINGTON OR 97812-9709

U.S. EPA ID Number
ORD089452353

Facility's Phone: (541) 454-2643

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes		
X	1. UN3077, WASTE ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (PENTACHLOROPHENOL, NAPHTHALENE), 9, III RQ (F032, F034) OR324427	1	DM	80	P	F032	F034	F035
X	2. UN3082, WASTE ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (PENTACHLOROPHENOL, NAPHTHALENE), 9, III RQ (F032, F034) OR324429	1	DM	60	P	F032	F034	F035
	3.							
	4.							

14. Special Handling Instructions and Additional Information
1 OR324427 - INC01 - SOIL, NAERG (171)
2 OR324429 - INC02 - DECONTAMINATION WATER, NAERG (171)
E/R PROVIDER: CHEMTREC (1-800-424-9300) CONTRACT NUMBER 24117

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name	Signature	Month	Day	Year
Kevin Smith for Hart Crowser	KS	6	22	16

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name	Signature	Month	Day	Year
Daniel E. Whitmore	Daniel E. Whitmore	06	22	16
Transporter 2 Printed/Typed Name	Signature	Month	Day	Year

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator) U.S. EPA ID Number

Facility's Phone:

18c. Signature of Alternate Facility (or Generator) Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.
H040	H040		

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name	Signature	Month	Day	Year
Par a West	Parawest	6	23	16

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

DESIGNATED FACILITY TO GENERATOR

6/79

APPENDIX C
Photograph Log – Vegetation Observations

Photograph 1 – Earthen cap and drainage swale in the foreground with the impermeable cap in the background. Taken looking south from Photograph Location 1 comparing baseline and current conditions. (Left - June 2011, Right - June 2016)

Photograph 2 - Tree and shrub plantings on the earthen cap. Taken looking southeast from Photograph Location 2. (June 2016)

Photograph 3 – Eastern edge of the earthen cap looking toward the drainage swale. Taken looking west from Photograph Location 3. (June 2015)

Photograph 4 – View of stormwater pond. Willow and alder have increased in size, although most of the pond remains barren or vegetated with grasses. The irrigation system was removed in 2016. Taken looking northeast from Photograph Location 4 comparing baseline and current conditions. (Left - June 2011, Right - June 2016)

Photograph 5 – Tree plantings on the earthen cap. Taken looking north from Photograph Location 5. (June 2015).

Photograph 6 – Impermeable cap dominated by grasses and herbaceous vegetation. Baseline photograph on the left taken looking east from Photograph Location 6 (June – 2011). Current conditions from June 2016 shown on the right. Cat's ear visible at bottom of photo on the right.

Photograph 7 – Vegetation growth and wood debris within the lower riparian component and along the shoreline. Taken looking southeast from Photograph Location 7 comparing baseline and current conditions. (Left - September 2011, Right – June 2016)

Photograph 8 – Upper riparian component with native trees and shrubs performing well. Taken looking southwest from Photograph Location 8. (June 2016)

Photograph 9 – Lower riparian component with large wood debris along the edge. Taken looking northwest from Photograph Location 9 comparing baseline and current conditions. (Left - June 2011, Right – June 2016)

Photograph 10 – North end of the lower riparian area, looking east. Oregon ash, red osier-dogwood, and nootka rose are faring relatively well within this area. (October 2016)